Ontario

Ministry of Energy

NEB UPDATE OF
ENERGY SUPPLY AND
DEMAND, 1983 to 2005

JANUARY, 1984

PART I

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PART II

MINISTRY OF ENERGY'S REPORT, "ONTARIO'S ENERGY DEMAND TO 2000: UPDATE 1983"

INTRODUCTION

The Ontario Ministry of Energy is pleased to respond to the National Energy Board's request for information, analyses and projections to assist in updating the Board's 1981 Energy Supply and Demand Report. The Ministry's submission consists of two parts.

Part I of the submission contains the following:

- Comparisons of the underlying assumptions used by the Ministry in its own energy demand analysis with those outlined by the NEB in relation to economic growth and world oil prices.
- Comparisons of the Ministry's projection of Ontario's energy demands to the year 2000 with projections based upon each of the NEB's scenarios.
- Detailed responses to the NEB's demand related questions.
- Comments on energy supply issues pertinent to Ontario.

Part II of the submission is the Ministry's report entitled "Ontario's Energy Demand to 2000: Update 1983". This document contains a detailed analysis of Ontario's future energy use by sector and fuel. It also provides a comprehensive discussion of the economic parameters, underlying assumptions and fuel price projections that determine these energy requirements.

A. GENERAL UNDERLYING ASSUMPTIONS

Introduction

The Ministry of Energy has provided, as Part II of its submission to the Board, a report entitled "Ontario's Energy Demand to 2000: Update 1983". It deals with the Ministry's projections of future Ontario requirements only. Hereafter, the results contained in Part II will be referred to as the "Base Case" in the Ministry's submission.

The foundation of the Ministry's projections is a macroeconomic projection of the provincial economy. This economic forecast takes account of the following:

- projections of Ontario's population growth and composition;
- international economic growth, primarily in the United States, and prospects for the overall Canadian economy; and
- projections of national and international energy prices.

The analysis of the alternative economic growth and world oil price scenarios that was requested by the National Energy Board required modification of some Base Case economic parameters and assumptions. The following sections detail these modifications and compare the results of energy demand projections based upon the NEB's scenarios with the Base Case results. Relevant summary tables are contained in the Appendix to Section A of Part I while the pro-forma tables requested by the Board are included in an Appendix to Part I of the submission.

I. NEB's ECONOMIC GROWTH SCENARIO

I.1. Comparison with Base Case Assumptions

- The NEB's Economic Growth Scenario, assumes real economic growth in Canada of 4.5 per cent per annum between 1983 and 1988, and 3.0 per cent annually between 1988 and 2000.

- The Base Case projects real Gross Domestic Product growth of 3.3 per cent annually between 1983 and 1990, and 2.8 per cent from 1990 to 2000. In the NEB's growth scenario, Ontario's real economic growth is assumed to match the national average. Thus, the major difference in economic assumptions between the Base Case and the NEB's scenario occurs in the 1983-88 period.

- In the Base Case, Ontario's nominal disposable income grows 9.2 per cent annually from 1983 to 2000 compared to 9.6 per cent in the NEB's case. Similarly, manufacturing production increases 3.1 per cent per year in the Base Case and 3.4 per cent in the NEB's case.

- It is assumed that relative shares for the service and goods-producing industries do not change from the Base Case. In addition, interest rates and the rate of inflation are assumed to be the same in the NEB's case.

I.2. Comparison with Base Case Energy Demand Results

Compared to the Base Case, by the year 2000, the NEB's scenario results in the following:

- Total primary energy demand is 6.2 per cent higher.

- Total secondary energy demand is 6.4 per cent greater.

- Industrial sector energy use increases the most, 10.5 per cent. Transportation sector demand increases by 4.4 per cent, commercial use by 2.0 per cent, and residential use by 1.1 per cent.

- In terms of secondary energy, coal demand is 9.7 per cent greater. Oil, natural gas and electricity use increases by approximately 6.0 per cent. Other fuels increase by 4.2 per cent.

The following sections elaborate on the comparison by sector and by fuel.

I.3. Industrial Sector

Since energy prices are maintained at Base Case levels, higher energy demand is solely a result of increased industrial output. Manufacturing real domestic product increases by 3.4 per cent annually over the 1982-2000 period compared to Base Case growth of 3.1 per cent per year. In addition, total industrial real domestic product grows by 3.1 per cent versus 3.0 per cent.

Compared to the Base Case, total energy demand is 10.5 per cent higher by 2000. This represents an average annual growth of 2.1 per cent versus 1.6 per cent in the Base Case for the 1980-2000 period.

Fuel shares in 2000 remain virtually unchanged from the Base Case except for electricity which increases its share marginally.

I.4. Commercial Sector

Service sector output is higher in the NEB's scenario than in the Base Case. This reduces unutilized floorspace and creates earlier pressure for additional facilities. Accordingly, total floorspace increases by 2 per cent per annum during the 1984-1988 period, compared to 1.5 per cent in the Base Case. After 1988, total floorspace grows by approximately 2.2 per cent per year in both cases. By 2000, total floorspace is approximately 3 per cent greater than in the Base Case.

Average energy use per unit of floorspace in existing buildings is assumed to be the same as in the Base Case. However, average efficiency of energy use in the total stock of buildings in the long run is expected to be slightly higher due to a greater proportion of more-efficient, new buildings.

Commercial sector total energy demand is about 2 per cent higher than in the Base Case by 2000. Fuel shares and growth rates change marginally from the Base Case over the 1984-2000 period.

I.5. Residential Sector

Higher economic growth is assumed to result in higher housing starts, increased average home size, additional appliance purchases and greater air conditioning saturation. All these factors tend to increase energy use compared to the Base Case.

However, higher economic growth also introduces some factors that reduce energy use in the residential sector. First, the existing housing stock is demolished at a higher rate than in the Base Case, replacing less energy-efficient homes with more energy-efficient ones. Second, increased disposable income encourages the replacement of existing heating systems with high-efficiency ones.

The net result is that by 2000, total energy use is 1.1 per cent greater than Base Case levels. Fuel shares remain unchanged from the Base Case.

I.6. Transportation Sector

Increased real disposable income results in total passenger-kilometres travelled growing an average of 0.3 per cent more per year than in the Base Case. General freight tonne-kilometres increase by a similar percentage. Intercity, specific freight and urban freight shipments average 0.1 per cent higher annual growth.

Since efficiency improvements are assumed to be a function of relative fuel costs, no direct efficiency changes were introduced in either the freight or passenger sectors. However, an indirect efficiency effect is achieved because of the higher level of total automobile registrations due to increased new car sales. Since income growth is significantly higher than the Base Case in the 1984-1988 period only, total registrations are assumed to return to Base Case levels by 1992. However, the higher proportion of newer cars increases the total fleet efficiency marginally.

Alternative fuels are assumed to capture the same percentage of total energy demand as in the Base Case.

Compared to the Base Case, this scenario results in greater total energy demand in every year after 1983. By 2000, total energy demand is 4.4 per cent greater than in the Base Case. Moreover, with the exception of electricity, annual demand for each fuel increases.

I.7. Energy Supply Sector

The stronger economic growth in this case causes oil use for petrochemicals, other non-energy uses and refineries to grow faster than in the Base Case, particularly between 1985 and 1995. Electricity generation requirements grow much more strongly, 2.7 per cent annually in the 1982-2000 period, compared to 2.4 per cent in the Base Case.

Assumptions about utility generation capacity expansion in Ontario are unchanged from the Base Case. To meet the higher electricity demand, both nuclear and coal generation capacity will be operated at higher rates in the NEB's scenario. The hydraulic share of electricity generation declines from 39 per cent in 1980 to 25 per cent in 2000. Other fuels for generation, such as natural gas, oil and waste, maintain a 1 per cent share over the entire period.

II. NEB's HIGH OIL PRICE SCENARIO

II.1. Comparison with Base Case Assumptions

- The world oil price (1982 $U.S., F.O.B. Persian Gulf) in the NEB's high price case declines from $28.30 in 1983 to $26.50 in 1984 and rebounds sharply in 1985 and 1986. From 1983 to 2000, the world price rises by 2.6 per cent per year.

- World oil prices in the Base Case increase by an average of 2.5 per cent annually between 1983 and 2000. While both forecasts have similar prices in 2000, the pattern of price increases is significantly different. The Base Case has no increase in real terms until 1986. The NEB's case contains a major price shock in 1985 and 1986, followed by relatively low, real increases for the rest of the forecast period. This different price path will accelerate the introduction of oil conservation and substitution measures compared to the Base Case.

- The natural gas/oil parity relationship remains at 65 per cent throughout the NEB's case. This ratio rises to 70 per cent by 1992 in the Base Case and remains at that level until 2000.

- Conventional old oil receives the world price (adjusted for quality and transportation) by 1992 in both the Base Case and the NEB's case.

- The Toronto refinery acquisition cost for oil increases 9.6 per cent annually over the 1983 to 2000 period in the NEB's case compared to 9.4 per cent annually in the Base Case. Over the same period, the wholesale price of natural gas increases 9.6 per cent annually in the NEB's case and 9.9 per cent in the Base Case. Short-run price increases are much higher in the NEB's case. By 2000, the Toronto refinery acquisition cost for oil is 2.3 per cent higher than the Base Case. However, due to the different natural gas/oil parity relationships in the Base and NEB's cases, the wholesale natural gas price is 5.0 per cent less than the Base Case in 2000.

- Electricity prices increase at the same rate in both scenarios.

- In the high price scenario any income effects are omitted. Thus, interest rates, disposable income, the exchange rate, manufacturing shipments, and housing starts are unchanged from the Base Case.

II.2. Comparison with Base Case Energy Demand Results

Compared to the Base Case, by the year 2000, the NEB's scenario results in the following:

- Total primary energy demand is 0.4 per cent lower.
- Total secondary energy demand is 2.5 per cent less.
- Transportation sector energy use declines by 5.2 per cent. Residential, industrial and commercial sectors decline by 2.0, 1.6, and 1.2 per cent, respectively.
- Secondary oil demand declines by 6.9 per cent. The other fossil fuels, natural gas and coal, decline by 3.2 and 2.6 per cent respectively. Electricity use increases by 3.6 per cent and other fuel demand is 2.5 per cent greater.

The following sections elaborate on the comparison by sector and by fuel.

II.3. Industrial Sector

In the NEB's High Oil Price Scenario the prices of industrial fuels, heavy fuel oil, natural gas and electricity, rise at about the same rate as in the Base

Case over the 1983-2000 time period. This results in energy prices that are only 2-3 per cent higher for oil and 5 per cent lower for natural gas over the full period.

However, the timing of the price changes is significantly different. The NEB's High Oil Price Scenario assumes that price increases will not be smooth. As a result, heavy fuel oil prices are 27 per cent above the Base Case in 1985, 30 per cent higher in 1990, but only 5 per cent higher by 1995. This pattern of price increases is assumed to accelerate efficiency investments and improvements in the industrial sector by an average of five years compared to the Base Case.

Over the 1980-90 period, total energy use grows at 0.8 per cent per annum, well below Base Case growth of 1.2 per cent. Over the full 1980-2000 period, energy use grows at an annual rate of 1.5 per cent, only slightly below the Base Case projection.

Oil use declines more rapidly in this scenario than in the Base Case. All other fuels experience slightly lower growth over the full period except for electricity. Electricity use grows at 2.4 per cent per annum versus 2.2 per cent in the Base Case.

II.4. Commercial Sector

Accelerated investment in retrofitting and other energy-saving measures is assumed to result in some increase in energy efficiency compared to the Base Case. However, the impact of higher prices is not likely to be felt immediately. Since commercial floorspace has a relatively low demolition rate, existing buildings will continue to constitute a higher proportion of floorspace than does new construction. This factor keeps average energy use in this sector at higher levels than if faster adjustment was possible. Consequently, it is assumed that most of the price impact is reflected in energy use during the 1986-1995 period. After 1995, further efficiency gains are expected to occur at a much slower rate.

By 2000, total energy use in the commercial sector decreases by 1.2 per cent compared to the Base Case. As in the Base Case, natural gas and electricity are expected to supply the bulk of energy demand. After 1985, electricity increases its share of the commercial market at the expense of natural gas particularly in the space heating market. This trend is most evident in the 1990s.

II.5. Residential Sector

This scenario assumes significantly higher oil and natural gas prices than the Base Case, especially between 1985 and the early 1990s. Electricity prices are marginally higher than in the Base Case. As a result, relative to both oil and gas, electricity is much more competitive than in the Base Case.

As in the Base Case, energy demand in the short term is expected to rise somewhat. However, the continuing impact of earlier price increases combines with the 1985 and 1986 price increases to restrain growth in energy demand throughout the rest of the 1980s. In fact, the decline in energy demand after 1985 is much steeper than in the Base Case.

The oil price impacts in 1985 and 1986 cause the off-oil shift to intensify. The increased competitiveness of electricity compared with natural gas results in more electrical space heating conversions than in the Base Case and higher electricity penetration in new housing. Therefore, electricity demand increases quite significantly while natural gas demand decreases from Base Case levels. The demand for wood and other fuels is also higher than in the Base Case.

By 2000, total secondary energy demand in the residential sector is projected to be 2.0 per cent lower than in the Base Case. Market shares for oil and natural gas are lower than in the Base Case. Electricity, wood, and other fuels increase their market shares relative to the Base Case.

II.6. Transportation Sector

The major impact of relatively higher oil and refined petroleum products prices is on the assumptions for new car fuel efficiencies and freight sector operating efficiencies.

New car fuel efficiencies are assumed to increase an average 2.73 per cent annually in the 1985-1991 period compared to a Base Case average of 0.85 per cent. However, this rate of increase declines to 1.15 per cent annually in the 1992-2000 period compared to the Base Case average of 1.25 per cent. By the year 2000, new cars are 12.5 per cent more efficient than in the Base Case.

Trucking sector operating efficiencies average 0.4 per cent annually in the 1985-88 period compared to no increase in the Base Case. After 1988, the Base Case average of 0.2 per cent annually is assumed to prevail.

By the year 2000, trucking sector efficiency is 1.6 per cent greater than in the Base Case. Marine and rail sector efficiencies remain at Base Case levels.

Other fuels are assumed to increase their market share relative to the Base Case. However, this is primarily due to the reduction in total energy demand rather than increased alternative fuel use. There are two reasons for this result. First, the oil price increases occur early in the forecast period when alternative fuel capacity is not in place for fuels other than propane. Second, after the initial price increases, the oil price path is more gradual than in the Base Case. Emerging technologies respond better to shock-like impacts than to gradual, steady growth states that allow non-technological adjustments to occur. By 2000, other fuels account for 60 PJ, or, 10.0 per cent of total energy use, compared to 58 PJ, or, 9.1 per cent, in the Base Case.

Total energy demand decreases in every year after 1985. By 2000, total energy demand is 5.2 per cent less than in the Base Case. However, the increased oil price has variable effects on fuel types. Gasoline and diesel are the most sensitive to oil price increases while aviation gas, fuel oil and electricity demands are relatively insensitive.

Total energy demand declines by 0.2 per cent per year compared to 0.1 per cent annual growth in the Base Case over the 1980-2000 period. The gasoline share of total energy demand decreases from Base Case levels but the diesel, fuel oil and alternative fuels increase their shares.

II.7. Energy Supply Sector

The lower oil use in this case results in decreased refiners' energy demand. Due to the faster rise in oil and natural gas prices in the near term, electricity generation increases by 2.3 per cent annually compared to 2.2 per cent in the Base Case.

Higher electricity demand results in greater nuclear generation starting in the mid-1980s, although its share in 2000 is down slightly from the Base Case. Since coal is the marginal fuel for electricity generation, coal demand increases relative to the Base Case. Coal use declines throughout the 1980s but returns to 1980 levels by 2000.

III. NEB's LOW OIL PRICE SCENARIO

III.1. Comparison with Base Case Assumptions

- The NEB's Low Oil Price Scenario contains a world oil price of $28.30 (1982 $U.S. F.O.B.) in 1983, declining to $26.50 in 1984. The price remains at this level throughout the forecast, representing a price decline of 0.4 per cent per year from 1983 to 2000.

- In the Base Case, the real world oil price declines in 1984, remains constant in 1985, and increases marginally in 1986. It advances by 3.6 per cent per year from 1987 to 2000 with the largest increases in the 1988 to 1992 period.

- The constant policy environment of the NEB's case implies that administered oil prices (NORP, COOP), and the relationship between the wholesale price of natural gas and the blended price of oil, remain intact .

- In the Base Case, COOP reaches the world price by 1992 (adjusted for quality and transportation). The wholesale price of natural gas is assumed to rise to 70 per cent of the price of blended oil in

Toronto by 1992. In the NEB's case, the relationship remains at 65 per cent throughout the forecast period.

- Over the 1983 to 2000 period, the blended oil price rises by 9.4 per cent per year in the Base Case compared to 6.6 per cent in the NEB's scenario. The wholesale natural gas price advances 9.9 per cent per year in the Base Case and 6.6 per cent in the NEB's case.

- Electricity prices increase at about the same rate in the NEB's case and Base Case over the 1983-2000 period.

- As in the High Oil Price Scenario, income effects arising from changes in world oil prices are omitted from the sectoral projections.

III.2. Comparison with Base Case Energy Demand Results

Compared to the Base Case, by the year 2000, the NEB's Low Oil Price Scenario results in the following:

- Total primary energy demand is 2.2 per cent higher.

- Total secondary energy demand is 3.7 per cent greater.

- The industrial sector uses 4.9 per cent more energy. Commercial sector energy demand is 2.9 per cent greater. The residential and transportation sectors use 2.6 per cent more energy.

- Secondary oil and natural gas demand are 10.0 and 7.8 per cent higher, respectively. Electricity use declines by 2.4 per cent and other fuels decrease 22.8 per cent.

The following sections elaborate on the comparison by sector and by fuel.

III.3. Industrial Sector

In the NEB's Low Oil Price Scenario, growth in industrial output is assumed to be the same as the Base Case. However, the price of all energy forms rises more slowly, leading to a lower level of conservation than in the Base Case. In addition, the prices of heavy fuel oil and natural gas are much lower relative to electricity. This results in less of a shift away from oil to gas in the near term, and, less movement from gas to electricity at the end of the forecast period.

Over the 1980-90 period, total energy use grows at approximately the same rate as in the Base Case. Over the full 1980-2000 period, total demand grows at an average annual rate of 1.8 per cent compared to 1.6 per cent in the Base Case. Oil use increases slightly over the period compared to a small decline in the Base Case. Natural gas use grows faster, 2.0 per cent per annum versus 1.6, and electricity demand is somewhat stronger, 2.3 per cent annually versus 2.2.

Over the forecast period, the oil share of total energy demand drops more slowly than in the Base Case. The share held by natural gas is higher and the shares held by the other fuels (coal and electricity) are slightly lower.

III.4. Commercial Sector

In response to significantly lower fuel prices, investment in retrofit and other energy saving measures is assumed to be less likely than in the Base Case. This results in higher average energy use per unit of floorspace after 1985.

Due to the increased price advantage of natural gas, greater penetration of the space heating market by natural gas at the expense of electricity is assumed. Total energy use increases since natural gas is less efficient than electricity in heat delivery.

By the year 2000, commercial sector total energy demand is 2.9 per cent greater than in the Base Case. The natural gas share of total energy demand increases from 50 to 54 per cent while the electricity share declines from 44 to 40 per cent. The oil share remains virtually unchanged from the Base Case.

III.5. Residential Sector

This scenario assumes significantly lower oil and natural gas prices and marginally lower electricity prices than the Base Case. As a result, relative to both oil and natural gas, electricity is less competitive than in the Base Case, especially after 1990.

Since oil is more competitive than in the Base Case, fewer off-oil space heating conversions are assumed. Due to shifts in the relative prices of electricity and natural gas, a smaller percentage of these conversions are to electricity and a larger percentage to natural gas. Moreover, lower electricity penetration and higher natural gas penetration in new housing is assumed.

Lower energy prices are assumed to reduce the incentive to invest in more efficient heating systems and appliances. As well, energy saving actions such as insulating, caulking and weather stripping are assumed to be adversely affected.

As in the Base Case, energy demand is expected to rise only slightly in the near term, mainly because of the continuing impact of earlier price increases and conservation. However, there is no significant decline in energy use between 1985 and 1995 and only a small decline after 1995. This is because real fuel prices remain relatively stable during this period.

By 2000, energy demand in the residential sector is 2.6 per cent higher than in the Base Case. The market shares for oil and natural gas increase while the electricity share declines.

III.6. Transportation Sector

As in the NEB's High Oil Price Scenario, the major impact of lower oil prices is on the efficiency of new cars. The Base Case assumed no increase in new car efficiencies during the 1984-88 period and a substantial increase in the 1989-95 period due to sharply higher oil prices. This scenario retains the Base Case efficiency profile through 1988 and assumes that new car efficiencies will improve an average of 0.87 per cent annually in the 1989-2000 period. The Base Case assumes an average 1.36 per cent per year improvement over the same period. However, total fleet efficiency improves even during the 1984-88 period due to replacement of older, less efficient stock by newer vehicles. Freight sector efficiencies remained at Base Case levels throughout the forecast period.

Alternative fuel use is assumed to decline from Base Case levels. Propane is assumed to be the only viable competitor because of its established market and demonstrated ability to compete over a wide range of oil prices. Propane use attains the 1990 Base Case level, which represents a 15 per cent decline in the other fuel category compared to the Base Case. Throughout the 1990s, propane is assumed to maintain a constant market share.

Transportation sector total energy demand is 2.6 per cent greater than Base Case levels by 2000. Fuel shares exhibit some changes with gasoline increasing its market share by nearly 3 percentage points. Diesel and turbo fuel shares increase by 0.3 percentage points. Other fuels suffer the greatest erosion in market share, declining to 3.2 per cent of total energy use by 2000 compared to 6.9 per cent in the Base Case.

III.7. Energy Supply Sector

The lower relative oil prices in this case result in more refinery oil use compared to the Base Case. Electricity generation declines relative to the Base

Case due to its competitive pricing disadvantage with oil and gas. Total electricity requirements grow at an average annual rate of 2.3 per cent compared to 2.4 per cent in the Base Case.

Nuclear generation grows slightly slower but maintains the same share of total generation as in the Base Case. Since coal is the marginal generation fuel, it is particularly sensitive to incremental changes in electricity demand. Therefore, coal use increases at half the Base Case rate in the 1990s, resulting in an average annual decline of 1.7 per cent over the 1980-2000 period compared to a 1.0 per cent decline in the Base Case. In addition, lower relative natural gas prices increase the levels and shares of cogeneration compared to the Base Case.

IV APPENDIX: ENERGY DEMAND TABLES

TABLE 0.0: SUMMARY COMPARISON OF SCENARIOS

Secondary Energy Demand by Fuel, 2000

(Base Case = 100)

	NEB High Economic Growth	NEB High Price	NEB Low Price
Oil	106	93	110
Natural Gas	106	97	108
Coal	110	97	101
Electricity	106	104	98
Other	104	103	75
Total	106	98	104

TABLE 0.1: BASE CASE

Total Primary Energy Demand by Fuel 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Oil	1,044	1,071	1,060	1,041	1,040	1,029	1,021	1,041	1,070
Natural Gas	680	712	736	746	780	792	861	899	963
Coal	489	487	430	439	414	400	401	461	544
Nuclear	389	445	540	557	620	665	765	860	996
Hydraulic	428	420	420	420	420	420	420	446	454
Other*	71	73	77	85	88	93	112	141	163
Total	3,101	3,208	3,263	3,288	3,362	3,399	3,580	3,848	4,190

* Other includes all fuels classed as other in the Total Secondary Energy Demand tables plus municipal solid waste and other energy waste used to generate electricity.

TABLE 0.2: BASE CASE

Total Secondary Energy Demand by Sector 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Residential	453	465	470	474	472	471	466	461	453
Commercial	280	283	287	290	292	293	297	324	348
Industrial	732	779	813	835	882	897	1009	1094	1235
Transportation	554	570	565	557	555	557	567	604	635
Total	2019	2097	2135	2156	2201	2218	2339	2483	2671

TABLE 0.3: BASE CASE

Total Secondary Energy Demand by Fuel 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Oil	788	810	800	783	777	764	742	745	759
Natural Gas	637	667	690	706	733	744	822	854	912
Electricity	346	358	368	377	383	389	416	469	532
Coal	177	189	200	207	222	230	250	277	310
Other*	71	73	77	83	86	91	109	138	158
Total	2,019	2,097	2,135	2,156	2,201	2,218	2,339	2,483	2,671

* Includes wood, wood waste, spent pulping liquor, propane, solar and other renewables.

TABLE 0.4: BASE CASE

Industrial Sector Energy Demand 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Oil	96	109	113	114	123	120	130	136	145
Natural Gas	276	295	308	317	336	341	409	433	490
Electricity	124	127	132	137	140	144	154	177	209
Coal	177	189	201	207	222	230	250	277	310
Other*	59	59	59	60	61	62	66	71	81
Total	732	779	813	835	882	897	1009	1094	1235

* Includes wood waste, spent pulping liquor, solar and other renewables.

TABLE 0.5: BASE CASE

Commercial Sector Energy Demand 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Oil	40	40	38	36	34	32	26	21	17
Natural Gas	140	141	145	148	150	152	155	167	174
Electricity	100	102	104	106	108	109	116	134	154
Other*	-	-	-	-	-	-	-	2	3
Total	280	283	287	290	292	293	297	324	348

* Includes solar and other renewable energy forms.

TABLE 0.6: BASE CASE

Residential Sector Energy Demand 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Oil	100	95	90	86	78	71	49	36	23
Natural Gas	221	231	237	242	247	250	258	254	248
Electricity	121	128	131	133	134	136	145	156	166
Other*	11	11	12	13	13	14	14	15	16
Total	453	465	470	474	472	471	466	461	453

* Includes wood and solar.

TABLE 0.7: BASE CASE

Transportation Sector Energy Demand 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Petroleum	551.6	566.4	558.9	546.6	542.1	541.2	537	552	574
Electricity	1.3	0.6	0.6	0.6	0.7	0.7	1	2	3
Other*	1.3	2.6	5.1	10.0	12.4	15.3	29	50	58
Total	554.2	569.6	564.6	557.2	555.2	557.2	567	604	635

* Includes propane, methanol and compressed natural gas.

TABLE 1.1: NEB ECONOMIC GROWTH CASE

Total Primary Energy Demand 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Oil	1,044	1,071	1,093	1,080	1,107	1,101	1,098	1,107	1,123
Natural Gas	680	712	761	788	824	843	916	969	1,034
Coal	489	487	429	445	449	418	437	493	653
Nuclear	389	445	540	566	620	710	817	948	1,016
Hydraulic	428	420	420	420	420	420	420	446	454
Other*	71	73	80	89	93	98	119	149	169
TOTAL	3,101	3,208	3,323	3,388	3,513	3,590	3,807	4,112	4,449

* Other includes all fuels classed as other in the Total Secondary Energy Demand tables plus municipal solid waste and other energy from waste used to generate electricity.

TABLE 1.2: NEB ECONOMIC GROWTH CASE

Total Secondary Energy Demand by Sector 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Residential	453	465	470	475	473	472	468	464	458
Commercial	280	283	293	294	297	300	309	334	356
Industrial	732	779	843	886	951	987	1096	1211	1365
Transportation	554	570	581	582	600	600	617	647	663
Total	2019	2097	2187	2237	2321	2359	2490	2656	2842

TABLE 1.3: NEB ECONOMIC GROWTH CASE

Total Secondary Energy Demand by Fuel 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Oil	788	810	827	818	831	820	803	801	806
Natural Gas	637	667	714	740	775	793	864	910	968
Electricity	346	358	367	379	389	402	438	497	564
Coal	177	189	199	213	235	248	269	303	340
Other*	71	73	80	87	91	96	116	145	164
Total	2019	2097	2187	2237	2321	2359	2490	2656	2842

* Includes wood, wood waste, spent pulping liquor, propane, solar and other renewables.

TABLE 1.4: NEB ECONOMIC GROWTH CASE

Industrial Sector Energy Demand 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Oil	96	109	121	125	131	131	142	153	166
Natural Gas	276	295	330	347	375	388	443	482	539
Electricity	124	127	130	137	145	154	171	199	235
Coal	177	189	199	213	235	248	269	303	340
Other*	59	59	63	64	65	66	71	74	85
Total	732	779	843	886	951	987	1096	1211	1365

* Includes wood waste, spent pulping liquor, solar and other renewables.

TABLE 1.5: NEB ECONOMIC GROWTH CASE

Commercial Sector Energy Demand 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Oil	40	40	41	36	35	34	27	21	17
Natural Gas	140	141	147	150	152	154	161	172	178
Electricity	100	102	105	108	110	112	121	139	158
Other*	-	-	-	-	-	-	-	2	3
Total	280	283	293	294	297	300	309	334	356

* Includes solar and other renewable energy forms.

TABLE 1.6: NEB ECONOMIC GROWTH CASE

Residential Sector Energy Demand 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Oil	100	95	90	86	78	71	49	36	23
Natural Gas	221	231	237	243	248	251	260	256	251
Electricity	121	128	131	133	134	136	145	157	168
Other*	11	11	12	13	13	14	14	15	16
Total	453	465	470	475	473	472	468	464	458

* Includes wood and solar.

TABLE 1.7: NEB ECONOMIC GROWTH CASE

Transportation Sector Energy Demand 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Petroleum Prod.	551.6	566.4	575.1	571.0	587.1	584.1	585.1	590.8	599.
Electricity	1.3	0.6	0.6	0.6	0.7	0.7	0.7	1.7	3.
Other*	1.3	2.6	5.1	10.0	12.5	15.7	31.0	54.0	60.
Total	554.2	569.6	580.8	581.6	600.3	600.5	616.8	646.5	663.

* Includes propane, methanol and compressed natural gas.

TABLE 2.1: NEB HIGH OIL PRICE CASE

Total Primary Energy Demand 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Oil	1,044	1,071	1,058	1,035	1,022	1,011	975	979	1,009
Natural Gas	680	712	725	745	750	761	800	878	940
Coal	489	487	434	454	454	403	444	487	583
Nuclear	389	445	540	557	620	730	800	895	1016
Hydraulic	428	420	420	420	420	420	420	446	454
Other*	71	73	77	86	90	93	117	149	168
TOTAL	3,101	3,208	3,254	3,297	3,356	3,418	3,556	3,834	4,170

* Other includes all fuels classed as other in the Total Secondary Energy Demand tables plus municipal solid waste and other energy from waste used to generate electricity.

TABLE 2.2: NEB HIGH OIL PRICE CASE

Total Secondary Energy Demand by Sector 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Residential	453	465	470	468	468	467	456	452	444
Commercial	280	283	293	290	285	285	286	320	344
Industrial	732	779	790	835	862	891	969	1075	1215
Transportation	554	570	565	555	550	548	548	573	602
Total	2019	2097	2118	2148	2165	2191	2259	2420	2605

TABLE 2.3: NEB HIGH OIL PRICE CASE

Total Secondary Energy Demand by Fuel 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Oil	788	810	798	777	761	748	702	693	707
Natural Gas	637	667	680	699	704	715	753	826	883
Electricity	346	358	367	381	397	413	441	487	551
Coal	176	189	197	207	215	224	250	270	302
Other*	72	73	76	84	88	91	113	144	162
Total	2019	2097	2118	2148	2165	2191	2259	2420	2605

* Includes wood, wood waste, spent pulping liquor, propane, solar and other renewables.

TABLE 2.4: NEB HIGH OIL PRICE CASE

Industrial Sector Energy Demand 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Oil	96	109	108	114	115	116	119	126	135
Natural Gas	276	295	296	317	326	335	369	426	482
Electricity	124	127	130	137	145	154	165	182	215
Coal	177	189	197	207	215	224	250	270	302
Other*	59	59	59	60	61	62	66	71	81
Total	732	779	790	835	862	891	969	1075	1215

* Includes wood waste, spent pulping liquor, solar and other renewables.

TABLE 2.5: NEB HIGH OIL PRICE CASE

Commercial Sector Energy Demand 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Oil	40	40	41	36	33	30	25	20	15
Natural Gas	140	141	147	146	140	140	139	161	170
Electricity	100	102	105	108	112	115	122	137	156
Other*	-	-	-	-	-	-	-	2	3
Total	280	283	293	290	285	285	286	320	344

* Includes solar and other renewable energy forms.

TABLE 2.6: NEB HIGH OIL PRICE CASE

Residential Sector Energy Demand 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Oil	100	95	90	83	77	70	43	30	18
Natural Gas	221	231	237	236	238	240	245	239	231
Electricity	121	128	131	135	139	143	153	166	177
Other*	11	11	12	14	14	14	15	17	18
Total	453	465	470	468	468	467	456	452	444

* Includes wood and solar.

TABLE 2.7: NEB HIGH OIL PRICE CASE

Transportation Sector Energy Demand 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Petroleum Prod.	551.6	566.4	558.9	544.5	536.6	531.7	515.0	517.6	538.9
Electricity	1.3	0.6	0.6	0.6	0.6	0.6	0.7	1.6	3.3
Other*	1.3	2.6	5.1	10.0	12.6	15.9	32.0	54.0	60.0
Total	554.2	569.6	564.6	555.1	549.8	548.2	547.7	573.2	602.2

* Includes propane, methanol and compressed natural gas.

TABLE 3.1: NEB LOW OIL PRICE CASE

Total Primary Energy Demand 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Oil	1,044	1,071	1,063	1,048	1,048	1,045	1,051	1,101	1,151
Natural Gas	680	712	737	771	807	829	889	959	1,055
Coal	489	487	432	438	419	393	411	459	515
Nuclear	389	445	540	557	620	665	715	843	982
Hydraulic	428	420	420	420	420	420	420	446	454
Other*	71	73	77	84	86	89	100	108	123
TOTAL	3,101	3,208	3,269	3,318	3,400	3,441	3,586	3,916	4,280

* Other includes all fuels classed as other in the Total Secondary Energy Demand tables plus municipal solid waste and other energy from waste used to generate electricity.

TABLE 3.2: NEB LOW OIL PRICE CASE

Total Secondary Energy Demand by Sector 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Residential	453	465	470	477	480	480	478	473	465
Commercial	280	283	287	290	296	298	304	330	357
Industrial	732	779	822	855	908	935	1009	1138	1295
Transportation	554	570	564	558	555	556	567	613	652
Total	2019	2097	2143	2180	2239	2269	2358	2554	2769

* Includes wood, wood waste, spent pulping liquor, propane, solar and other renewables.

TABLE 3.3: NEB LOW OIL PRICE CASE

Total Secondary Energy Demand by Fuel 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Oil	788	810	803	789	785	779	771	803	835
Natural Gas	637	667	692	724	759	779	834	904	983
Electricity	346	358	367	376	381	386	406	463	519
Coal	176	189	205	208	229	237	249	279	313
Other*	72	73	76	83	85	88	98	105	119
Total	2019	2097	2143	2180	2239	2269	2358	2554	2769

* Includes wood, wood waste, spent pulping liquor, propane, solar and other renewables.

TABLE 3.4: NEB LOW OIL PRICE CASE

Industrial Sector Energy Demand 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Oil	96	109	116	118	122	125	134	148	161
Natural Gas	276	295	310	332	356	367	406	459	529
Electricity	124	127	132	137	140	144	154	181	211
Coal	177	189	205	208	229	237	249	279	313
Other*	59	59	59	60	61	62	66	71	81
Total	732	779	822	855	908	935	1009	1138	1295

* Includes wood wastes, spent pulping liquor, solar and other renewables.

TABLE 3.5: NEB LOW OIL PRICE CASE

Commercial Sector Energy Demand 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Oil	40	40	38	36	35	33	27	22	18
Natural Gas	140	141	145	148	153	157	165	179	194
Electricity	100	102	104	106	108	108	112	128	143
Other*	-	-	-	-	-	-	-	1	2
Total	280	283	287	290	296	298	304	330	357

* Includes solar power and other renewable energy forms.

TABLE 3.6: NEB LOW OIL PRICE CASE

Residential Sector Energy Demand 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Oil	100	95	90	88	85	78	61	41	28
Natural Gas	221	231	237	244	250	255	264	266	260
Electricity	121	128	131	132	132	133	139	152	162
Other*	11	11	12	13	13	14	14	14	15
Total	453	465	470	477	480	480	478	473	465

* Includes wood and solar.

TABLE 3.7: NEB LOW OIL PRICE CASE

Transportation Sector Energy Demand 1982 - 2000

(PJ)

	1982	1983	1984	1985	1986	1987	1990	1995	2000
Petroleum Prod.	551.6	566.4	558.7	546.9	543.1	542.9	548.5	592.0	627.7
Electricity	1.3	0.6	0.6	0.6	0.6	0.6	0.7	1.6	3.3
Other*	1.3	2.6	5.1	10.0	11.2	12.6	18.0	19.0	21.0
Total	554.2	569.6	564.4	557.5	554.9	556.1	567.2	612.6	652.0

* Includes propane, methanol and compressed natural gas.

B. DEMAND

Introduction

The National Energy Board requested detailed responses to a number of energy demand-related questions. The Ministry of Energy's response to these questions refers exclusively to Ontario's energy demand.

The analysis presented in Part II, "Ontario's Energy Demand to 2000 - Update 1983", presents the Base Case projections for Ontario's primary and secondary energy demand. This analysis was prepared with the aid of detailed, end-use models of Ontario's secondary demand. Primary energy requirements are estimated with an accounting model that utilizes the secondary energy demand results and assumptions about the energy supply sector.

The information in Part II is a prerequisite for understanding and assimilating the responses to individual questions in the demand section. In many of these responses, the reader will be referred to relevant sections of Part II that cover the specific question.

8.1 THE EXTENT TO WHICH THE DECLINE IN ENERGY DEMAND IN RECENT YEARS HAS BEEN RELATED TO THE DECLINE IN ECONOMIC ACTIVITY RESULTING FROM THE RECESSION, TO A DELAYED RESPONSE (BY MEANS OF CONSERVATION) TO THE LARGE PRICE INCREASES OF THE 1970S OR TO OTHER FACTORS.

Part II provides historical data as well as projections for energy use by sector and by fuel. Sections of this document which deal with the 1980-85 period clearly demonstrate that economic growth and energy prices have exerted a major influence on secondary energy use in the province in the 1980-82 period. Key conclusions include the following:

- Total secondary energy demand fell by 12 per cent.

- Sectors hardest hit by the recession (goods-producing industrial sectors and transportation) registered the largest declines in energy use, while those which were relatively little affected by the recession in terms of real output (service sectors) showed little change in energy use.

- Fuels whose real prices had increased most dramatically since 1973 (oil and natural gas) recorded the largest declines in demand.

- Furthermore, the off-oil policy has resulted in substitution mainly to natural gas and electricity, and, to a lesser extent, wood.

In order to estimate the impacts of energy price changes on energy use, one can assume - and plausibly so - that the following characteristics are important:

- Short run price elasticities are smaller than long run elasticities.
- The long run could exceed twenty years in some areas of the economy. However, for practical purposes, most of the total impact is likely to occur within twenty years. In the case of road vehicles, the long run could be in the range of 6 to 12 years.
- The price elasticity of total secondary demand (net of substitution effects) is much less than it is for any given energy fuel - both in the short as well as in the long run.
- Large energy price changes affect inflation, employment, real income and production. These macroeconomic impacts, unless offset by economic policy, lead to changes in energy demand beyond those directly attributable to price elasticities.

Based on these considerations, as well as the actual domestic price increase which occurred between 1973 and 1982, it is estimated that the direct effect of price escalation on total energy demand - that is, the effect arising from the overall own-price elasticity - was quite substantial in the 1980-82 period.

- About 40 per cent of the drop in energy demand was due to direct price effects. Most of this can be traced to the lagged response to the 1973-79 price increases. Only a small part of the 1980-82 price effects was registered on the basis of the short run elasticity.

The 1981-82 recession was due in part to the 1980-82 domestic energy price increases. However, Ontario's economy proved to be much more sensitive to other contractionary influences such as high interest rates, fiscal policy and weak international markets. In particular, major export industries, many of which are large energy users, suffered above average declines in production and in energy use.

- The recession accounted for some 60 per cent of the 1980-82 decline in Ontario's secondary energy demand. Most of this effect was attributable to the influence of factors such as interest rates and weak export markets.

The above analysis separates the change in energy demand into components associated with price and economic activity variables. This is in accord with a large body of economic theory. In this case, one would view conservation and efficiency as parameters determining the magnitude of price and income/production elasticities. An alternative approach would be to focus on the impacts of conservation and efficiency improvements. However, it can be argued that to the extent that energy users make decisions on conservation and efficiency on the basis of economics, this alternative approach directs attention to the channels through which economic variables exert their influence.

There is undoubtedly much merit in both views of the manner in which conservation and efficiency affect energy demand. However, it is considerably more difficult to apply the alternative approach empirically than it is to estimate the impacts of price and economic variables.

The following table summarizes the estimated impacts of energy prices and the recession on Ontario's energy demand.

TABLE B.1.1

ESTIMATED IMPACTS OF ECONOMIC GROWTH AND ENERGY PRICES ON ONTARIO'S TOTAL SECONDARY ENERGY DEMAND, 1980-82

	% Change in Energy Demand 1980-82
A. Direct Effects of Energy Price Escalation	
o Lagged 1973-79 effect	- 3.2
o 1980-82 price effect	- 1.5
Sub-Total	- 4.7
B. Economic Growth	
o Due to energy price increases	- 1.8
o Due to other factors (e.g., interest rates, fiscal policy, international economic conditions)	- 5.5
Sub-Total	- 7.3
TOTAL (A & B)	-12.0

o THE RECESSION ACCOUNTED FOR ABOUT 60% OF THE 1980-82 DECLINE IN ONTARIO'S TOTAL SECONDARY ENERGY DEMAND.

B.2 THE PREVALENCE OF AND PROSPECTS FOR DUAL-FUEL CAPABILITY IN THE INDUSTRIAL SECTOR AND FOR HYBRID SYSTEMS (E.G., ELECTRICITY-OIL) AND HEAT PUMPS IN THE RESIDENTIAL SECTOR.

In many situations, as heating systems have been converted from oil, the oil firing capability has either been retained or could be easily re-instated. In the Industrial Sector this has become very common practice in order to both improve security of supply and to provide the capability to use the cheapest fuel on short notice.

Most companies which received cost sharing grants under the Ontario Industrial Oil Substitution and Energy Conservation Incentive Program responded in this way. The federal government's Industrial Conservation Assistance Program (ICAP) requires recipients to sign contracts for at least three years with natural gas suppliers, but only specifies that at least 50 per cent of the energy requirements must be supplied by gas.

Currently, in Ontario, one-third of industrial natural gas sales are made on an interruptible basis so such customers must retain dual-fuel capability. In addition, wood and electricity are supplementary energy sources. Thus, in the Industrial Sector, considerable capability exists already and this is expected to increase.

A similar situation applies in the Commercial Sector although volumes are smaller.

In the Residential Sector, conversions from oil to natural gas are generally irreversible but the addition of electrical resistance heating or heat pumps to oil systems results in dual-fuel capability. However, in this market, since oil (adjusted for seasonal efficiency) is generally more expensive than electricity, the oil will, in general, only be used when the capacity of the electrical system is exceeded. At current prices, an oil furnace with seasonal efficiency of greater than 77 per cent would, however, make oil cheaper.

More dual-fuel systems are expected to be installed over time but eventually the rate of installations will fall off as the existing stock of oil furnaces is retired.

Overall, the heat pump is assumed to be present in 4.4 per cent of Ontario homes by the year 2000. Due to its high seasonal efficiency, it could reduce energy demand by 4 PJ by that year. Wood burning systems also can provide dual-fuel capability.

8.3 THE EXTENT TO WHICH THE SHIFT TOWARD SMALLER, FUEL EFFICIENT CARS WILL BE REVERSED BY LOWER THAN EXPECTED GASOLINE PRICES.

Automobile industry sales data for the first half of 1983 indicate that the more fuel-efficient compact and sub-compact models account for a lower percentage of new car sales than in 1982 for Canada and Ontario. Public perceptions that oil supply is ample, the amendments to the Ottawa-Alberta oil pricing agreement that are maintaining relatively constant domestic oil prices, and retail gasoline price competition have combined to encourage at least some of this alteration in consumer tastes.

However, there are some other influences that have contributed to this trend. "Buy Canadian" campaigns may have had a small effect on decisions to purchase the larger, relatively less efficient, North American produced autos. Also, the restrictions on Japanese automobile imports have reduced availability of these more efficient models. Moreover, at least two of the three large, North American automobile manufacturers do not expect to achieve the corporate average fuel economy (C.A.F.E.) standards set by the United States Department of Transportation for the 1983-85 model years. In part, this is due to changes in the production ratios of large and small cars in response to consumer demand. However, amendments to the initial legislation removed the likelihood of financial penalties for manufacturers that failed to comply with the standards. Thus, much of the incentive for achieving the legislated mandates was removed.

It is difficult to separate the influences of these various conditions on consumers' choices. The Base Case assumes that all these factors will result in a postponement of average new car fuel efficiency improvements for several years. Therefore, in the Base Case, new car fuel efficiencies are assumed to remain constant at 1984 projected levels through 1988.

The 1984 new car fuel efficiency level was estimated to achieve about one-third of the C.A.F.E. mandated increase. Therefore, in the Base Case, new car fuel efficiences are estimated to improve by 2.4 per cent in 1984 rather than 6.8 per cent. Even though new car efficiencies are projected to remain constant until 1988, the total automobile fleet becomes more efficient as new vehicles replace older, less efficient ones.

B.4 THE LEVEL OF SUBSTITUTION FOR MOTOR GASOLINE BY ALTERNATIVE TRANSPORTATION FUELS SUCH AS DIESEL FUEL, NGV (NATURAL GAS FOR VEHICLES), PROPANE, METHANOL, HYDROGEN AND ELECTRICITY.

The degree of petroleum substitution by alternative transportation fuels in any given year will be dependent upon relative fuel costs but even more dependent upon the existence of a fuel supply infrastructure and adequate vehicle technology. Even when supply and technology issues are resolved, the rate of commercialization may still be slow.

Substitution Summary

The Base Case for alternative fuel use is summarized as below:

Petroleum Substitution
(Petajoules)

	1985	1990	1995	2000
Propane	10	18	28	32
Methanol Blend (incl. cosolvent)	-	9	19	18
Neat methanol	-	1	1	5
CNG	-	1	2	3
Electricity	0.6	1	2	3
TOTAL FOR ABOVE ENERGY FORMS	10.6	30	52	61
Total Transportation Use	557.2	566.7	604.0	635.4
% Substitution	1.9	5.3	8.6	9.6

Propane

There are currently approximately 25,000 propane vehicles in operation in Ontario. The Base Case assumes 50,000 in 1985 and 200,000 in 2000. A high rate of conversions of new vehicles is assumed to occur until 1990, with a significant slow down after 1995. This is due to anticipated saturation of the fleet market and possible increases in relative propane prices as the current Canadian oversupply is reduced. The Base Case does not assume significant conversions to propane by individual car owners.

Methanol Blend

Methanol and cosolvent blended with gasoline are currently in commercial use in the United States and West Germany. The Base Case assumes that up to 10 per cent methanol cosolvent will be blended with 25 per cent of the total gasoline pool in 1990 and that this blending will be extended to 50 per cent of the gasoline pool in 1995 and 2000. Lead phase down programs might result in a speed up in the rate of methanol blend introduction and in the percentage of the gasoline pool involved.

Neat Methanol

The Base Case assumes that neat methanol use in gasoline vehicles will reach the initial stages of commercialization by 2000. The vehicle fleet using neat methanol would be 20,000 to 30,000. However, some observers believe that neat methanol vehicles will be in full commercial use by 1995. On that basis, assuming a methanol vehicle fleet of 150,000 in 1995, the gasoline replaced by neat methanol would be equal to approximately 5.7 PJ.

The Base Case does assume some use of methanol in compression ignition engines in 1990 and beyond, primarily in 2-cycle bus engines. If environmental concerns restrict the use of diesel fuel in road transportation, methanol usage may be significantly greater than shown in the Base Case.

Natural Gas for Vehicles (NGV)

Commercial use of compressed natural gas in Ontario road transportation is expected to lag use in other provinces where NGV user economics are favourable compared to propane. The Base Case assumes that commercialization of NGV follows propane and is directed to the commercial fleet area. Should storage tank development or commercial availability of dual-fuel vehicles proceed more rapidly than expected, NGV usage could increase significantly.

Electricity

Virtually all of the transportation electricity in the Base Case is used for rail and urban transit. If technical development programs now underway produce an advanced-technology battery, electricity in road transportation could become significant prior to the end of this century.

Hydrogen and Ethanol are not expected to be significant fuels for transportation in this century.

B.5 THE PROSPECTS FOR RAIL ELECTRIFICATION, AND FOR INCREASED USE OF ELECTRICITY IN INTRA-URBAN ROAD TRANSPORTATION

Selective electrification of railways is expected to proceed in Ontario but the impact on oil and electricity consumption will be small before 2000. Prospects for the use of electricity in intra-urban road transportation have been commented on in B-4.

B.6 THE IMPACT OF TECHNOLOGICAL CHANGE ON ENERGY DEMAND THROUGH SUCH FACTORS AS IMPROVED FURNACE EFFICIENCIES, CHANGING INDUSTRIAL PROCESSES, IMPROVED AUTOMOBILE AND TRUCK FUEL EFFICIENCIES AND MODIFICATIONS ON AIRCRAFT ENGINES.

The Base Case includes assumptions regarding the influence of technological change on Ontario's energy demand. These are summarized below.

Industrial Sector

Since the early 1970s, there has been a significant reduction in energy use per unit output in the industrial sector, mainly because of the implementation of more efficient operating practices and the replacement of capital stock upon normal turnover with energy-efficient combustion and process equipment. Between 1985 and 2000, new capacity could have per unit fossil fuel requirements which are 15-25 per cent below those of existing plants. This could result in a 5-10 per cent saving in fossil fuel use.

In this sector two shifts in process orientation could also have significant impacts on energy demand by 2000. First, the use of plasma arc furnaces in the steel industry could reduce coke demand by 50-60 PJ and increase electricity requirements by 25-45 PJ in 2000. These estimates are based on the assumption that the plasma arc process will require 60 per cent less coking coal and that one-third of steel-making capacity will adopt plasma arc technology by 2000. The extent to which steelmakers switch to plasma arc furnaces will depend upon the commercialization of the technology, the rate at which existing coke ovens need to be replaced, requirements for new ovens and the expected price of electricity relative to coking coal and other fuels.

Second, the use of thermal mechanical pulping (TMP) in the pulp and paper industry could reduce fossil fuel use and increase electricity use by about 10 PJ by 2000. TMP uses about 50 per cent more electricity but less fossil fuel than chemical pulping.

Residential Sector

The last few years have witnessed the development and introduction of condensing and pulse natural gas furnaces and boilers with conversion efficiencies well over 90 per cent. Also, the heat pump has been introduced into the space heating and cooling market. The introduction of condensing oil and natural gas water heating systems appears imminent. Technology that significantly improves the energy efficiency of most major appliances has been developed.

Any widespread adoption of these new technologies would significantly restrain growth in energy demand in the residential sector.

The Base Case includes the following assumptions with respect to improvements in heating system efficiencies:

- The average efficiency of natural gas furnaces increases by about 20 percentage points between 1980 and 2000. This results in a reduction in annual natural gas use of approximately 50 PJ by 2000.

- The average efficiency of oil furnaces increases by about 6 percentage points between 1980 and 2000, resulting in a 3 PJ reduction in annual fuel oil demand by 2000.

Heat pumps are assumed in 4.4 per cent of Ontario homes by the year 2000. Due to their high seasonal performance factor, total energy demand would be reduced by 4 PJ in that year.

With respect to water heating, the average conversion efficiency is assumed to increase by 10 per cent for gas water heaters and 5 per cent for electric water heaters. These translate into a reduction in energy demand of about 7 PJ, most of which represents a reduction in natural gas use.

The Base Case also assume a 10 per cent improvement in the efficiency of lighting and appliances between 1980 and 2000. This results in a 9 PJ reduction in energy (i.e., electricity) use by 2000.

With respect to solar energy, limited application for space and water heating by 2000 is assumed.

Improved design and building practices are other areas in which technological change can have a significant impact on energy demand. The Base Case assumes that improved design and building practices account for a 33 per cent reduction in per unit heating requirements for new buildings by 2000. This translates to a reduction in energy demand of about 30 PJ by that year.

Commercial Sector

Currently, commercial buildings use an average of 49 kilowatt hours of energy per square foot of floor space per year. By 1985, energy use in these buildings is expected to be reduced by 6.5 per cent.

The potential impact of technological and design measures for energy reduction is much greater in new buildings than for existing structures. For example, more efficient heating systems could be incorporated in the construction phase. Cost considerations, however, are expected to limit full adoption. Consequently, space heating is assumed to be about 40 per cent more efficient in new construction after the mid-eighties compared with facilities existing in 1980. Similarly, lighting is expected to be about 45 per cent more efficient. By 2000, annual energy use could be reduced by about 50 PJ due to improved technological and design measures.

Transportation Sector

Technological change in the transportation sector can reduce energy demand by improving the direct conversion of fuels to useful work and by improving the operational environment of vehicles and transportation systems.

Since the oil price increases of the 1970s, considerable technological effort and investment have been expended to improve conversion efficiencies. The average passenger vehicle in 1983 is smaller, lighter, more aerodynamic, and has a smaller, more efficient powerplant than its predecessor. Furthermore, several technological improvements that are available today, such as fuel injection, turbo-powered diesel engines, microprocessor controlled fuel-mixtures and constant varying ratio transmissions, could come into general use within the next few years. However, the rate of adoption of these technological innovations in the passenger vehicle sector is somewhat uncertain in view of the slow growth of oil prices in the near-term.

In the airline industry, turbo-fan engine technology offers substantial fuel savings and is incorporated in the new generation of wide-bodied and medium distance airliners. As well, the substitution of lighter weight materials for passenger seating and interiors is another source of efficiency gains. However, as in the road-vehicle sector, general adoption of these technological improvements is uncertain. Although the new generation of airliners is currently available, replacement of the existing fleet has not occurred as rapidly as was expected a year or two ago. The slower growth of fuel price increases is a factor, but, more important, the decline in total airline industry cash flow has caused indefinite delays in new equipment purchases.

There is considerable scope in the road-freight sector for improving conversion efficiencies. Combustion efficiency can be improved by wider acceptance of diesel engines in light to medium size trucks, turbo-diesel engines in heavy trucks, and improved aerodynamics. As in other sectors, the reduction in industry cash flows in recent years, as well as lower projections for fuel prices, are expected to hinder the adoption of fuel saving measures.

In addition to the gains from conversion efficiencies, technological change can improve the operational environment of vehicles and transportation systems. Computer controlled traffic signal systems can expedite traffic flows. Integrated freight systems can increase loading density and reduce excessive on and off-loading. Re-routing of freight to reduce back-hauling and dead-heading offers further savings.

The Base Case does not explicitly include provisions for operational improvements. Instead, energy efficiency from these sources is subsumed in the 'on-road' efficiencies of new cars and the general efficiency improvements in the airline and trucking sectors. More detail regarding automobile efficiencies is included in B.3.

B.7 HOW THE CHANGING INDUSTRIAL STRUCTURE (E.G., CHANGES IN PRODUCT MIX, GROWTH OF HIGH-TECHNOLOGY INDUSTRIES) WILL AFFECT ENERGY DEMAND.

In the Base Case some significant shifts occur in the industrial structure over the 1980 to 2000 time period. The share of real domestic product (RDP) accounted for by primary industry (agriculture, forestry, mining) is projected to fall from 3.1 per cent to 2.1 per cent. The share of RDP held by manufacturing falls from 30 per cent to 27 per cent. Projected growth in manufacturing, 2.3 per cent per annum from 1980-2000, is well below that of the economy as a whole (2.8 per cent) and of the service sector (3.2 per cent).

Were industrial and manufacturing shares of RDP to remain at 1980 levels throughout the forecast period, industrial energy demand would be significantly higher. Keeping the other Base Case assumptions constant, industrial energy demand would be 13.5 per cent higher than in the Base Case. This would raise average annual growth over the period to 2.25 per cent from 1.6 per cent.

After adjusting for the lower service sector share of output, the net increase in total secondary energy demand would be 5 per cent by the end of the century. This would increase the secondary energy growth rate to 1.1 per cent per annum from 0.8 per cent.

B.8 THE PROSPECTS FOR ELECTRICITY PRICES AND THE IMPLICATIONS THEREOF ON THE DEGREE OF INTERFUEL COMPETITION BETWEEN NATURAL GAS AND ELECTRICITY PARTICULARLY IN ONTARIO.

The Base Case assumes nominal electricity price increases of 7.4 per cent per year between 1983 and 2000. The electricity price rises most quickly in the near term (next 5 to 7 years) as additional capacity is put in place. With the slowdown in capacity additions in the 1990s, coupled with modestly lower interest rates, electricity prices are projected to rise at 6.5 per cent per year in the 1990 to 2000 time period.

In the Base Case, electricity's share will increase the most in the residential sector, advancing from 24 per cent in 1980 to 37 per cent in 2000 in terms of total residential requirements. Electricity's share of secondary energy demand in the commercial sector increases from 35 per cent in 1980 to 44 per cent in 2000. The industrial share rises from 15 per cent in 1980 to 17 per cent in 2000.

In 1982, Ontario Hydro announced a new corporate strategy which includes a marketing thrust to capture a target 20 per cent of the secondary energy market by 1990. Ontario Hydro's marketing program, including marketing incentives, is now under active development. These incentives will include new rate structures in the industrial sector, and other incentives to increase market share in both the residential and commercial sectors.

The Base Case does not allow for the potential impact of Ontario Hydro's marketing program.

8.9 THE IMPACT OF ELECTRICITY EXCHANGE BETWEEN REGIONS ON THE DEMAND FOR OTHER FUELS.

Ontario Hydro's efforts to strengthen interprovincial and international electricity interconnections and to provide the necessary transmission within Ontario will provide additional electrical supply security and conserve capital otherwise needed to develop new generation facilities in each of the separate regions.

The identification of suitable routes for 500 kV transmission lines in both southwestern Ontario and eastern Ontario is proceeding. These two projects will strengthen interconnections with Michigan and Quebec.

Future demand for Ontario electricity exports to the U.S. will depend on market conditions, availability of transmission and the regulatory environment in the U.S. The outlook for Ontario electricity exports based on coal fired generation is uncertain. During the period mid-1980s to mid-1990s, it is anticipated that Ontario Hydro's exports to the U.S. will be increasingly based on appropriately priced nuclear generation surplus to Ontario's own requirements.

In the 1980s, Ontario Hydro's purchases of electricity from Hydro Quebec will depend largely on its availability, price and the ability of the purchases to displace Ontario's coal fired generation.

Ontario Hydro's electricity purchases from Manitoba are not projected to change significantly. Purchase will be constrained by price, transmission limits and surplus generating capacity in Ontario.

8.10 THE COMPETITION IN THE INDUSTRIAL SECTOR BETWEEN HEAVY FUEL OIL AND OTHER ENERGY FORMS

To address this issue, competition in the industrial sector between heavy fuel oil (HFO) and natural gas, between HFO and coal, and between HFO and electricity, is discussed . First, a brief summary of the HFO situation in Ontario is provided.

HFO Supply in Ontario

Heavy fuel oil is a residual product of refinery operations and, in the short term, the quantity of production is fixed in relation to the quantity of crude oil used. Because it is a residual product, it is priced to clear the market, and to this extent it can inhibit the penetration of natural gas. In the longer term, HFO production can be altered either by changing the pattern of crude oil purchases or by investing in more upgrading facilities.

Because of excess refining capacity - a situation likely to persist throughout the forecast period - it is unlikely that, once current projects are completed, there will be any further investment in extensive upgrading facilities in Ontario. Two further developments, however, could affect Ontario's production:

1. Gulf Canada has announced the down-sizing of its Clarkson refinery. Plans call for the crude tower to be operated at 50,000 bpd. While some heavy ends may be converted to asphalt, most are expected to be sent by pipeline, together with other energy streams, to Quebec refineries.

2. A possibility exists for the province's petrochemical industry to use increasing amounts of natural gas liquids as feedstock. This would reduce crude use in Ontario and could reduce HFO production by as much as 6,000 bpd.

As a result of these developments, it appears that there may be no surplus of HFO in the Ontario market over the medium term. Competition between HFO and other fuels, however, will also be affected by international prices to the extent that imports and exports are permitted by the Board.

Competition with Natural Gas

Within the industrial sector, HFO competes directly with natural gas. Many major industrial users have dual-fuel capability and are able to switch between the two depending on price. Such switching can occur with respect to both short term firm and interruptible natural gas contracts. Currently, supplies of HFO have tightened so as to increase prices and diminish its competitive advantage.

Natural gas prices to Ontario industry are currently higher than those paid by some competitors in the United States. The cost of natural gas per unit of industrial output has risen significantly in the past three years, to the point where some industries competing with sister plants for world markets have dropped from having the lowest cost of production to fourth or fifth ranking.

Competition with Coal

The main users of coal in Ontario are: Ontario Hydro (13.4 million tonnes), the integrated iron and steel industry which includes Stelco, Dofasco and Algoma Steel (5.3 million tonnes) and general industry (730,000 tonnes).

Ontario Hydro has only one generating station designed for oil firing and this station is currently mothballed.

The integrated iron and steel industry in Ontario used 5.3 million tonnes of coal in 1982 to produce coke for the blast furnaces. HFO can not compete with coal in this application.

In other industrial applications, it is probable that there will be a move away from HFO to coal and other fuels. This move will depend to a large extent on government financial incentives, relative fuel prices and environmental issues.

Competition with Electricity

Because of availability of surplus nuclear, hydraulic and coal-fired generation, and as part of its new marketing strategy, Ontario Hydro has recently adopted experimental rates which offer electricity in limited quantities at rates well below current levels for limited periods. These rates will be closer to Ontario Hydro's system incremental running costs.

Such rates, coupled with commercial availability of new electrotechnologies (which offer improved energy efficiency, ease of process control, increased precision of heat application and reduced pollution), could result in increased demand for electricity in the specific dual-fuel industrial market, and in the industrial sector overall. The Ministry has not made a specific assessment of the extent to which the new industrial rates and increased penetration of new electrotechnologies will affect the industrial sector demand beyond what has already been assumed in the Base Case.

B.11 THE POTENTIAL FOR NATURAL GAS USE IN NEW GEOGRAPHIC AND INDUSTRIAL MARKETS (E.G., VANCOUVER ISLAND, MARITIMES, DIRECT SALES).

In Ontario, the Distribution System Expansion Program (DSEP) is enabling utilities to provide natural gas service to areas beyond existing distribution systems. To date, the majority of customers have been residential and commercial.

The industrial sector provides the greatest potential for natural gas to capture a larger share of the off-oil market. In some cases, this will require further extension of the distribution system and significant capital investment.

Stable and competitive natural gas pricing and marketing efforts could also increase the use of natural gas by industrial enterprises.

The issue of direct sales or direct purchase by customers of their natural gas supplies was the subject of a major review by the Ontario Energy Board in 1983. The Ministry of Energy will provide a copy of the OEB report when it is issued.

C. SUPPLY

Ontario Oil and Natural Gas Reserves and Production

Because of the age and marginal economics of many of Ontario's oil and gas pools, reservoir data needed for accurate forecasts of remaining reserves and productive capacity are often not available. Based on past and current trends, however, some reasonable projections can be made.

For crude oil, increased activity resulting from world prices for new oil is expected to maintain productive capacity at its current level through 1990. Thereafter, production is expected to decline by 5 per cent per year.

Sufficient prospects for new natural gas reserves exist to maintain Ontario natural gas production at about 450 x $10^6 m^3$ per year through 1995, with a slow decline in subsequent years.

Ontario does not have sufficient data to address all of the oil and natural gas supply issues raised by the NEB but does wish to comment on some, as follows.

OIL SUPPLY ISSUES

C.1 WHETHER THE CURRENT EMPHASIS ON OIL-DIRECTED DRILLING, AND OIL WELL WORKOVERS IS EXPECTED TO RESULT IN SIGNIFICANTLY HIGHER LEVELS OF RESERVES ADDITIONS AND FUTURE PRODUCTIVE CAPACITY THAN FORECAST PREVIOUSLY BY THE INDUSTRY.

Ontario expects that the emphasis on oil-directed drilling and workovers will continue through this decade after which gas-directed drilling will again pick up. While both should increase, the effect will probably be greater on productive capacity than on ultimate recoverable reserves, particularly in light and medium pools. The overall result is a moderation in the productive capacity decline rate for perhaps 10 years, followed by an increase in the decline rate in subsequent years.

C.2 THE CONTRIBUTION OF ENHANCED RECOVERY PROJECTS TO RESERVES ADDITIONS AND PRODUCTIVE CAPACITY FOR BOTH THE LIGHT AND MEDIUM, AND HEAVY CRUDE OIL CATEGORIES.

The contribution of enhanced recovery projects will be quite sensitive to expectations regarding future netbacks, particularly in light and medium pools. An expectation of little or no increase in real future netbacks (related to a forecast of only minor growth in constant-dollar NORP prices)will not likely result in much growth in EOR activity in these pools. A reduction in prices of LPG's relative to oil prices would improve the economics of hydrocarbon miscible floods. Such a move would also expand markets for LPGs in olefins manufacture and production of motor gasolines.

Even with higher price expectations, enhanced recovery techniques are not expected to have a substantial impact in Ontario oil pools because of engineering and environmental factors as well as economics.

C.3 THE FACTORS NECESSARY TO SUSTAIN THE RECENT SIGNIFICANT INCREASES IN THE PRODUCTION OF HEAVY CRUDE OIL.

No comment.

C.4 WHETHER THERE WILL BE SUFFICIENT CONDENSATE AVAILABLE TO USE AS A DILUENT FOR THE MOVEMENT OF HEAVY CRUDE OILS AS WELL AS FOR OTHER PURPOSES SUCH AS REFINERY FEEDSTOCK, PETROCHEMICAL FEEDSTOCK AND ENHANCED OIL RECOVERY.

This issue is addressed in conjunction with C.7.

C.5 THE IMPACT OF LIMITED CONDENSATE SUPPLY ON BITUMEN TYPE PROJECTS AND ON CONVENTIONAL HEAVY CRUDE OIL PRODUCTION.

This issue is addressed in conjunction with C.7.

C.6 THE FUTURE AVAILABILITY OF HEAVY CRUDE OIL AND UPGRADED HEAVY CRUDE OIL FROM OIL SANDS, AND THE DESIRABILITY OF THE TREND TOWARD SMALLER SCALE PROJECTS.

This issue is addressed in conjunction with C.7.

C.7 THE CONDITIONS REQUIRED TO MAKE ECONOMICALLY VIABLE THE UPGRADING OF HEAVY CRUDE OIL FOR USE AS A DOMESTIC FEEDSTOCK.

Ontario does not have definitive forecasts of either condensate or heavy crude/bitumen production but does have some concerns relating to these issues. The current emphasis on developing technologies for, and expanding productive capacity of very heavy crude oils, will demand an increasing proportion of segregated condensate supply. While this in itself should not create other than localized problems, the lack of domestic markets for the additional supply of diluted heavy crudes may result in an increasing export of condensate used as diluent. This, in turn, would exacerbate the refining/petrochemicals feedstock supply problems associated with the expected continuing decline in light crude reserves and producibility.

Such a loss of premium light crude supply is probably necessary for several years to prove heavy oil reserves and productive capacity, a prerequisite to the development of heavy crude oil upgraders. In the longer term, however, Ontario submits that it is essential that a framework be devised whereby the growing production of heavy crude oil can be upgraded for use in Canada.

C.8 THE LIKELIHOOD OF DISCOVERING AND/OR DEVELOPING COMMERCIALLY RECOVERABLE OIL RESERVES IN THE FRONTIER AREAS, THE PROBABLE TIMING OF DEVELOPMENT, AND LEVELS OF PRODUCTION.

No comment.

C.9 THE CURRENT EXCESS DELIVERABILITY OF NATURAL GAS AND WAYS OF MANAGING OR REDUCING IT (E.G., GAS STORAGE, PRORATIONING, INCENTIVE MARKETING).

The current problem of excess deliverability stems from three developments:

1. Declining demand in traditional domestic markets and dramatic decreases in U.S. takes of Canadian gas licensed for export.

2. Prebuilding of pipeline transmission capacity for new markets east of Montreal.

3. Successful exploration and development efforts.

The solution to the problem of excess deliverability of Alberta reserves will be increased sales, in both the domestic and export markets. Increased sales in the domestic market will be dependent on whether natural gas prices will be set at a level to maintain base loads to existing customers, while allowing potential new consumers to see future price stability, and a price advantage in their fuel choices. Increased sales in existing markets can be expected with general economic recovery, but not to their previous levels due to conservation and alternate fuels use.

The problem of excess capacity in current transmission systems will not be solved unless new domestic markets for gas are developed and export volume deliveries resume to levels for which the current facilities have been constructed.

C.10 **THE LONG-TERM EFFECTS ON EXPLORATION, DEVELOPMENT AND RESOURCE RECOVERY OF SUCH FACTORS AS PROLONGED WEAK DEMAND, CONTRACTUAL ABROGATIONS AND REDUCED PRODUCER NETBACKS.**

No comment.

C.11 **THE LIKELIHOOD AND TIMING OF THE DEVELOPMENT OF COMMERCIAL NATURAL GAS RESERVES IN FRONTIER AREAS AND THE PROBABLE LEVEL OF OUTPUT FROM THESE RESERVES.**

No comment.

C.12 **NEW CONCEPTS OR PROBABLE DEVELOPMENTS WITH RESPECT TO NON-CONVENTIONAL (VERY LOW PERMEABILITY) RESERVOIRS.**

No comment.

C.13 THE EFFECT OF THE REQUIREMENT FOR NGL FOR ENHANCED RECOVERY PROJECTS ON THE AVAILABLE SUPPLY OF ETHANE, PROPANE AND BUTANES.

Currently in Ontario, small amounts of NGLs are used as petrochemical feedstock (475,000 m^3 of propane and 225,000 m^3 of butane in 1982). The majority of petrochemicals, however, are produced from crude oil fractions. These plants were built on the assumption that profits from the sale of fuel products could be applied to the remaining refinery fractions to reduce the net cost of petrochemical feedstocks. Now that conditions have changed and fuel products, especially heavy fuel oil, no longer command high prices in the market, this offset is no longer available. Accordingly, NGLs are becoming increasingly attractive as a petrochemical feedstock. At the limit, as much as 3,000,000 m^3 of NGLs, or 35 per cent of current production, could be required to feed eastern Canadian plants.

However, this change in feedstock would require some capital investment on the part of the industry. Whether NGLs will be priced so as to induce this much of a change is uncertain. A more likely petrochemical demand would be for 1,500,000 m^3/year of NGLs, split evenly between propane and butane. This rate of NGL usage might be expected as early as 1986. The growth in demand from 1986 to the end of the period under review could be expected to parallel GNP growth.

C.14 THE EFFECTS OF THE REDUCED PRODUCTION OF NATURAL GAS AND REDUCED REFINERY THROUGHPUT ON THE AVAILABILITY OF NGL.

No comment.

C.15 EXPECTED TRENDS IN NGL YIELDS FROM NATURAL GAS RESERVES ADDITIONS.

No comment.

C.16 THE LIKELY ROLE OF NUCLEAR GENERATION IN FUTURE DOMESTIC SUPPLY

The Government of Ontario is committed to the economic and safe use of nuclear power. Ontario's nuclear program will increase the security of energy supply through the development of indigenous resources.

Since the Ministry's 1980 submission to the NEB, the Government of Ontario has reaffirmed this commitment to nuclear technology in the 1981 BILD program which indicates that "the Government will prepare Ontario for the transition to an economic system in the 1980s based increasingly on electrical power and nuclear technology".

Electrical generation from nuclear stations is expected to grow at about five percent per annum over the 1980 to 2000 period. Most of this growth occurs in the 1980s. The nuclear share of total provincial electrical energy generated to meet domestic demand is projected to approach 60 percent by the 1990s. The nuclear share of Ontario Hydro's generation, which includes exports of surplus generation, will be higher than this, particularly in the early to mid-1990s.

Ontario electricity generating capacity, including small utilities and industrial establishments, is expected to increase to almost 29,000 MW by 1990. Nuclear generating capacity will account for almost 13,000 MW. Hydraulic capacity will be just over 7000 MW and coal capacity will be reduced by retirements to under 9000 MW. Available gas and oil capacity will be about 300 MW, mostly industrial cogeneration.

The Base Case indicates that additional large scale base load generation will not be required to meet electrical demand before the year 2000. Similarly, Ontario Hydro does not presently plan any additional nuclear generating capacity after the completion of Darlington currently scheduled to be fully in service by 1992.

In the NEB Economic Growth Case and the NEB High Oil Price Case, electricity demand growth is significantly higher. This could require the rehabilitation or upgrading of existing fossil-fired capacity or the addition of new base load generation before the year 2000 to maintain supply security and for economic and environmental reasons.

C.17 THE POTENTIAL FOR DEVELOPMENT OF ADDITIONAL HYDROELECTRIC GENERATING PLANTS.

Small Hydraulic Development

The Ontario government is supporting the development of small hydro electric power plants.

The objective of this program is to add 100 MW (peak) by 1995 at 100 to 300 sites. The goal of this program is to create a climate in Ontario that will encourage the development and redevelopment of small hydraulic facilities by private and public agencies.

Small hydraulic facilities are considered to be less than 2000 kW annual average energy capacity. Larger sites (up to 20 MW) that are not developed by Ontario Hydro are also considered to be "small hydro".

Ontario has many sites where small amounts of hydraulic power can be produced. These sites are too small to be of interest to Ontario Hydro. There appear to be several institutional and financial constraints preventing the development of these sites by municipalities, private interests, and other groups. This program addresses these constraints.

This program has included ten demonstrations, an inventory of hydraulic resources, grants for feasibility studies and a range of information activities including conferences. Through these activities the Ministry is acting as a catalyst to encourage non-government development of small hydro. This 100 MW program will be additional to the capacity to be added by Ontario Hydro over the same time period. Approximately 500 MW of small hydro could ultimately be developed in Ontario.

Ontario Hydro's Hydraulic Program

The Ontario overnment encourages Ontario Hydro to develop the remaining hydroelectric potential in the province to an extent that is financially and environmentally feasible.

Constraints on hydroelectric development include the currently projected generation surplus, the need to maintain corporate financial soundness, requirements for transmission to connect the individual sites to load and the high unit energy costs for many of the remaining sites.

Ontario Hydro has adopted a strategy to maintain a hydraulic study program to ensure that the best of the remaining hydraulic sites will be available for development with a relatively short lead time. Ontario Hydro expects to carry out preliminary studies and in some cases, pre-engineering studies.

Ontario Hydro's current uncommitted program for hydraulic development in the 1990s anticipates the addition of about 650 MW (peak) capacity, out of a total of 3000 MW (peak) capacity under study.

The 3000 MW (peak) hydraulic study program represents about one-third of the remaining potential, much of which is in the Albany River System. This is currently not under study.

C.18 THE ROLE AND SIGNIFICANCE OF CURRENT AND FUTURE INDUSTRIAL GENERATION CAPABILITY

Ontario industrial generation capacity, largely cogeneration, is currently over 600 MW. The economic potential for additional cogeneration by the year 2000 is expected to be several hundred megawatts. The technical potential could be as high as one thousand or more megawatts from this source.

The amount and timing of future industrial generation depends largely on economics, principally relative fuel prices, industrial electricity rates, interest rates and escalation rates.

Sharp increases in the relative price of electricity or incentives to cogenerate could spark accelerated development of this source of generation.

Lead times for industrial generation are much shorter than for conventional generation. This flexibility may make it attractive to encourage industrial generation as one future supply option if load growth is much faster than forecast.

C.19 THE EFFECT OF TIGHTER AIR QUALITY EMISSION STANDARDS AND ANY OTHER REGULATORY RESTRICTIONS ON ELECTRIC POWER GENERATION

Ontario Hydro is currently under a Ministry of the Environment Control Order which requires it to reduce acid gas emissions from existing levels (531,000 tonnes in 1982) to 450,000 tonnes by 1986 and to 300,000 tonnes by 1990.

Base Case projections for coal-fired electricity generation are low enough that the 1990 air quality emission standards can be met without retrofitting existing stations with flue gas desulphurization (FGD) equipment. The NEB's Economic Growth and High Oil Price Scenarios indicate that while the 1990 target will be met, standards may be exceeded by the late 1990s unless additional emission reduction measures are taken.

The regulatory environment as it relates to the period beyond 1990 is uncertain at this time. A bilateral acid gas control strategy between the United States and Canada could lead to more stringent regulations in Ontario.

C.20 THE ROLE OF WESTERN COAL IN ELECTRIC POWER GENERATION

In 1982 Ontario Hydro purchased 13.4 million tonnes of coal for electrical power generation. Western Canadian bituminous coal constituted 2.1 million tonnes of this amount, while Western Canadian lignite accounted for 0.9 million tonnes. The proportion of Western Canadian coal of total coal volumes is expected to increase in the 1980s. However, Ontario Hydro is predicting a reduction in absolute coal usage from 13 million tonnes in 1982 to 4 million tonnes by 1990, as a result of decreasing electricity growth forecasts and greater reliance on the output from hydro-electric and nuclear power generating stations.

The role of western coal in electric power generation in the 1990s is dependent on many factors: demand growth, Ontario Hydro's ability to burn Western coal at its existing generating stations, transportation costs, transportation system flexibility and responsiveness, emission control strategies and regulation. Because of boiler design criteria and precipitator performance characteristics, low sulphur Western bituminous coal must be blended with higher sulphur U.S. coal. At present, Nanticoke generating station is the only station with a blending capability. Western lignite can only be burned at Atikokan and Thunder Bay Stations.

Thus, as the quantities of coal purchased by Ontario Hydro are reduced, the percentage of Western Canadian coal will increase. However, in order to retain flexibility, Hydro must be able to obtain coal from U.S. sources as well as Western Canadian ones.

C.21 THE EXPECTED CONTRIBUTION TO ENERGY SUPPLY OF OTHER FORMS OF ENERGY SUCH AS COAL, WOOD AND WOOD PRODUCTS, PULPING LIQUOR, ALCOHOL, BIOMASS, SOLAR, WIND AND TIDAL POWER.

Municipal Solid Waste

The Base Case forecast assumes that use of municipal solid waste (M.S.W.) for electrical generation will rise to 5 PJ by 2000.

The use of M.S.W. in industrial applications and for district heating could increase the total energy supplied by this source significantly by 2000.

Wood

Wood and wood waste are being used extensively today in industrial (pulp and paper) and residential applications. By 2000, the total usage in Ontario is expected to rise to 90 PJ from the current level of about 70 PJ. About one-sixth of this will be in the residential sector. However, development of very economical automatic wood burning furnaces and better availability of wood in suburban areas at competitive prices could increase the total consumption of wood in the residential sector.

Solar

Solar technologies have been developing rapidly over the past decade both in Canada and abroad. The future impact of solar energy hinges on the continuation of industry-based product development, prices of conventional fuels and rates of consumer acceptance.

With the energy price assumptions in the Base Case, 1995 fuel displacement by solar technologies is estimated to be 19 PJ. The largest contributions are expected to come from residential passive solar heating and commercial and industrial hot water process heating. Passive solar heating is treated in the Base Case as a conservation measure rather than a supply technology measure.

If lower prices are assumed the contribution from solar technologies would be somewhat lower. If oil price increases are higher than that envisaged in the NEB's High Oil Price Scenario, these displacements would increase significantly by the year 2000.

Wind

Wind is not expected to make any significant energy contribution in Ontario under anticipated conditions. Most applications will be stand-alone systems in remote areas though a small number of grid-connected applications are anticipated.

Peat, Lignite and Oil Shale

Because of the long lead times needed, as well as the high capital cost involved for the development of the province's peat, lignite and oil shale resources, it is unlikely that these resources will substantially contribute to the energy supply picture before the year 2000.

D.1 THE PROSPECTS OF CANADIAN ENERGY SELF-SUFFICIENCY OVER THE PERIOD OF THE FORECAST, WITH PARTICULAR EMPHASIS ON LIGHT AND MEDIUM CRUDE OIL.

Achievement of oil self-sufficiency remains a priority goal for Canada. It is recognized that substitution of other energy forms (natural gas, electricity, biomass, methanol, etc.) as well as the structural changes described earlier will help to achieve this goal. Nevertheless, even with the lower consumption expected compared with previous forecasts, achieving and maintaining this goal will require the development of substantial new supplies from bitumen-based synthetic crude plants, from upgrading conventional heavy crude oils and from the frontiers, in addition to ongoing development of conventional light and medium crudes in Western Canada.

Ontario lacks the definite cost information necessary to project what mix of such sources is most appropriate for the Canadian economy but exploitation to some degree of all such sources will probably be necessary. Domestic policies regarding pricing, quality differentials and economic rents will be key determinants in the emphasis given to each such source.

The strong efforts directed to developing technology for efficient extraction of heavy and very heavy crudes are vital to future exploitation of these resources. If they are to provide a major contribution to Canada's future needs, however, concomitant effort is needed to develop the technology and economic environment for upgrading these resources into high quality refinery feedstocks. With the current world productive capacity cushion in light and medium crudes expected to diminish or disappear over the next 10 years, upgrading capability should not be long delayed.

The achievement of an approximate statistical balance between total crude oil and equivalent productive capacity and total oil demand should not obscure Canada's vulnerability to foreign supply disruptions. Indeed, as heavy crude capacity is expanded without upgrading, more premium quality refinery feedstock (pentanes plus/light crude) used as a pipelining diluent is diverted from Canadian markets to export, increasing this vulnerability.

Ontario believes, therefore, that bitumen/heavy crude upgrading must be developed with, or closely follow, the development of basic production capability.

D.2 THE CONTINUED AVAILABILITY AND MAGNITUDE OF OUR EXPORT MARKET FOR HEAVY CRUDE OIL AND FACTORS WHICH MAY ENHANCE OR RESTRICT THE MARKET.

The U.S. market for heavy crudes will probably remain strong for two or three years. Beyond this period, increasing heavy crude production from off-shore California (Santa Barbara Channel and Santa Maria Basin) coupled with maintenance of current levels of Alaska North Slope medium crude production will probably act to diminish this market for Canadian exports. This prospect increases the desirability of installing heavy crude upgrading facilities during this decade, as noted in the comments under C.7.

D.3 THE LIKELY SHORT-TERM MARKET FOR CANADIAN GAS IN THE UNITED STATES WITH A PARTICULAR ASSESSMENT OF THE EFFECT OF POSSIBLE DEREGULATION OF THE PRICE OF NATURAL GAS IN THE UNITED STATES AND THE CONSEQUENT COMPETITIVE POSITION OF CANADIAN NATURAL GAS IN RELATION BOTH TO U.S. GAS AND RESIDUAL FUEL OIL.

There is currently a great deal of uncertainty surrounding the future of U.S. natural gas policy, with respect to domestic and import supplies, pricing and regulation.

Congress remains divided over the issue of reregulation or deregulation of the price of natural gas due to diverse estimates by interested parties of the impact of either on future natural gas prices in the U.S. market. Further, the legislation may contain language on natural gas imports which may have a significant impact on Canada.

The content of the legislation therefore remains highly speculative in light of the pending U.S. election, the advent of the 1983/84 heating season and industry's progress to date in responding to market realities. A substantial delay in replacing the Natural Gas Policy Act (NGPA) is possible, creating continued uncertainty in the short-term outlook for the U.S. market.

With respect to the competitive position of Canadian gas in relation to both U.S. gas and residual fuel oil, Ontario submits that in our province's neighbouring U.S. states, heavy fuel oil currently seems to be setting the price for natural gas in the industrial market, through the exercising of contractual flexibility supported by most state regulatory commissions. This apparent flexibility in the U.S. natural gas industry has evolved through a recognition on the part of producers, pipelines, distributors and regulators, that the industry as a whole must reduce the industrial load losses experienced in the past two years. In order to sustain existing loads and regain lost loads, natural gas prices have reacted to heavy fuel oil competition in the recent past. As long as current excess deliverability remains, natural gas prices can be expected to continue to fluctuate to meet the market.

Canadian gas entering the U.S. market must therefore compete in the short-term with surplus U.S. supplies which are currently enjoying flexible transportation and distribution rates to meet competition from other fuels in industrial markets.

Studies recently completed on behalf of the Ministry with respect to natural gas supply and demand show the following long-range trends in the U.S. market:

1. Natural gas demand will continue to decline, falling to about 17 TCF in 1983, improving modestly in 1984-1985, followed in 1986 by slow but steady growth through to the year 2000. The demand levels attained prior to 1980 will not be attained again until after 2000.

2. Domestic natural gas supply in the U.S. market will continue to be greater than 18 TCF through to 1990, falling by about 2 TCF by 2000. The mix of gas will change considerably, away from Gulf Coast reserves towards tight sands and Rocky Mountain production.

3. Natural gas imports to the U.S. from Mexico and Canada will rise continuously throughout the 1990s and will account for one quarter of U.S. total supply by 2000.

   Canadian gas imports, presently significantly below authorized levels, will grow to nearly 2.5 TCF by 2000. Most of the recently authorized exports require U.S. import approvals.

These studies assume that U.S. gas deregulation would have little influence on gas prices, and caution that market planning will remain difficult during the short and medium terms.

D.4 THE LIKELY LEVEL OF EXPORTS OF ELECTRICITY TO THE UNITED STATES AND THE EXPECTED SELLING PRICE; IN PARTICULAR, ANY INFORMATION ON THE FUTURE TREND OF THE PRICE OF COAL IN THE U.S. AND ITS RELATIONSHIP TO THE PRICE OF OIL.

The Ontario government supports Ontario Hydro's efforts to market its surplus generation in the U.S. on an interruptible as well as a firm basis subject to the regulatory process governing electricity exports which ensures that Canadian interests are safeguarded.

There is currently some uncertainty surrounding the long term prospects for exports of Ontario electricity in the U.S., particularly in the coal displacement markets. However, the oil displacement market is expected to be there for ten to twenty years, mainly in the New York and New England markets. Uncertainty stems from competition from neighbouring utilities in Canada and the U.S., transmission bottlenecks and political factors in the U.S.

With Ontario Hydro's successful experience in this market and with the increasing availability of appropriately priced surplus nuclear generation, and as part of its new corporate strategy, Ontario Hydro is working towards maintaining current levels of electricity exports.

The Base Case deals with Ontario's domestic energy demand. The Ministry does not prepare its own forecast of electricity exports and associated fuel requirements.

APPENDIX: NEB FORMS

FORM 8

BASE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1982

SECTOR(1)	GW.h	PJ(2)
Residential	34,000	121
Commercial	28,000	100
Industrial	34,000	124
Transportation - Road		
- Rail		
- Total	<1,000	1
Other	2,000	8
Total	98,000	354
Utility Own Use and Losses	8,000	28
Total Domestic Flectricity Requirement(3)	106,000	382

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

BASE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1983

SECTOR[1]		GW.h	PJ[2]
Residential		36,000	128
Commercial		28,000	102
Industrial		35,000	127
Transportation	- Road		
	- Rail		
	- Total	< 1,000	1
Other		2,000	7
Total		104,000	375
Utility Own Use and Losses		10,000	37
Total Domestic Electricity Requirement[3]		114,000	412

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

BASE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1984

SECTOR(1)	GW.h	PJ(2)
Residential	36,000	131
Commercial	29,000	104
Industrial	37,000	132
Transportation - Road		
- Rail		
- Total	<1,000	1
Other	2,000	7
Total	104,000	375
Utility Own Use and Losses	10,000	37
Total Domestic Electricity Requirement(3)	114,000	412

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

BASE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1985

SECTOR(1)	GW.h	PJ(2)
Residential	37,000	133
Commercial	29,000	106
Industrial	38,000	137
Transportation - Road		
- Rail		
- Total	< 1,000	1
Other	2,000	7
Total	107,000	384
Utility Own Use and Losses	10,000	37
Total Domestic Electricity Requirement(3)	117,000	421

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

BASE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1986

SECTOR(1)	GW.h	PJ(2)
Residential	37,000	134
Commercial	30,000	108
Industrial	39,000	140
Transportation - Road		
- Rail		
- Total	<1,000	1
Other	2,000	7
Total	109,000	390
Utility Own Use and Losses	10,000	37
Total Domestic Electricity Requirement(3)	119,000	427

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

BASE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1987

SECTOR(1)		GW.h	PJ(2)
Residential		38,000	136
Commercial		30,000	109
Industrial		40,000	144
Transportation	- Road		
	- Rail		
	- Total	<1,000	1
Other		2,000	7
Total		110,000	397
Utility Own Use and Losses		11,000	38
Total Domestic Electricity Requirement(3)		121,000	435

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

BASE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1990

SECTOR(1)	GW.h	PJ(2)
Residential	40,000	145
Commercial	32,000	116
Industrial	43,000	154
Transportation - Road		
- Rail		
- Total	< 1,000	1
Other	2,000	7
Total	118,000	423
Utility Own Use and Losses	11,000	41
Total Domestic Electricity Requirement(3)	129,000	464

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

BASE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1995

SECTOR(1)	GW.h	PJ(2)
Residential	43,000	156
Commercial	37,000	134
Industrial	49,000	177
Transportation - Road		
- Rail		
- Total	<1,000	2
Other	2,000	8
Total	132,000	477
Utility Own Use and Losses	13,000	45
Total Domestic Electricity Requirement(3)	145,000	522

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

BASE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 2000

SECTOR(1)		GW.h	PJ(2)
Residential		46,000	166
Commercial		43,000	154
Industrial		58,000	209
Transportation	- Road		
	- Rail		
	- Total	1,000	3
Other		2,000	9
Total		150,000	541
Utility Own Use and Losses		14,000	50
Total Domestic Electricity Requirement(3)		164,000	591

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

NEB ECONOMIC GROWTH CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1984

SECTOR(1)		GW.h	PJ(2)
Residential		36,000	131
Commercial		29,000	105
Industrial		36,000	130
Transportation	- Road		
	- Rail		
	- Total	<1,000	1
Other		2,000	7
Total		104,000	374
Utility Own Use and Losses		10,000	37
Total Domestic Electricity Requirement(3)		114,000	411

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

NEB ECONOMIC GROWTH CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1985

SECTOR(1)	GW.h	PJ(2)
Residential	37,000	133
Commercial	30,000	108
Industrial	38,000	137
Transportation - Road		
- Rail		
- Total	< 1,000	1
Other	2,000	7
Total	107,000	386
Utility Own Use and Losses	11,000	38
Total Domestic Electricity Requirement(3)	118,000	424

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

NEB ECONOMIC GROWTH CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1986

SECTOR(1)	GW.h	PJ(2)
Residential	37,000	134
Commercial	31,000	110
Industrial	40,000	145
Transportation - Road		
- Rail		
- Total	< 1,000	1
Other	2,000	7
Total	110,000	397
Utility Own Use and Losses	11,000	38
Total Domestic Electricity Requirement(3)	121,000	435

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

NEB ECONOMIC GROWTH CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1987

SECTOR(1)		GW.h	PJ(2)
Residential		38,000	136
Commercial		31,000	112
Industrial		43,000	154
Transportation	- Road		
	- Rail		
	- Total	<1,000	1
Other		2,000	7
Total		114,000	410
Utility Own Use and Losses		11,000	39
Total Domestic Electricity Requirement(3)		125,000	449

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

NEB ECONOMIC GROWTH CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1990

SECTOR[1]	GW.h	PJ[2]
Residential	40,000	145
Commercial	34,000	121
Industrial	48,000	171
Transportation - Road		
- Rail		
- Total	< 1,000	1
Other	2,000	8
Total	124,000	446
Utility Own Use and Losses	12,000	42
Total Domestic Electricity Requirement[3]	136,000	488

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

NEB ECONOMIC GROWTH CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1995

SECTOR[1]	GW.h	PJ[2]
Residential	44,000	157
Commercial	39,000	139
Industrial	55,000	199
Transportation - Road		
- Rail		
- Total	<1,000	2
Other	2,000	9
Total	141,000	506
Utility Own Use and Losses	13,000	47
Total Domestic Electricity Requirement[3]	154,000	553

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

NEB ECONOMIC GROWTH CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 2000

SECTOR[(1)]		GW.h	PJ[(2)]
Residential		47,000	168
Commercial		44,000	158
Industrial		65,000	235
Transportation	- Road		
	- Rail		
	- Total	1,000	4
Other		3,000	10
Total		160,000	575
Utility Own Use and Losses		14,000	51
Total Domestic Electricity Requirement[(3)]		174,000	626

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

NEB HIGH OIL PRICE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1984

SECTOR(1)	GW.h	PJ(2)
Residential	36,000	131
Commercial	30,000	108
Industrial	36,000	130
Transportation - Road		
- Rail		
- Total	< 1,000	1
Other	2,000	7
Total	105,000	377
Utility Own Use and Losses	10,000	37
Total Domestic Electricity Requirement(3)	115,000	414

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

NEB HIGH OIL PRICE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1985

SECTOR(1)	GW.h	PJ(2)
Residential	38,000	135
Commercial	30,000	108
Industrial	38,000	137
Transportation - Road		
- Rail		
- Total	< 1,000	1
Other	2,000	7
Total	108,000	388
Utility Own Use and Losses	10,000	38
Total Domestic Electricity Requirement(3)	118,000	426

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

NEB HIGH OIL PRICE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1986

SECTOR(1)	GW.h	PJ(2)
Residential	39,000	139
Commercial	31,000	112
Industrial	40,000	145
Transportation - Road		
- Rail		
- Total	< 1,000	1
Other	2,000	7
Total	112,000	404
Utility Own Use and Losses	11,000	40
Total Domestic Electricity Requirement(3)	123,000	444

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

NEB HIGH OIL PRICE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1987

SECTOR(1)	GW.h	PJ(2)
Residential	40,000	143
Commercial	32,000	115
Industrial	43,000	154
Transportation - Road		
- Rail		
- Total	< 1,000	1
Other	2,000	7
Total	117,000	420
Utility Own Use and Losses	11,000	41
Total Domestic Electricity Requirement(3)	128,000	461

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Flectricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

NEB HIGH OIL PRICE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1990

SECTOR[1]	GW.h	PJ[2]
Residential	42,000	153
Commercial	34,000	122
Industrial	46,000	165
Transportation - Road		
- Rail		
- Total	<1,000	1
Other	2,000	6
Total	124,000	447
Utility Own Use and Losses	12,000	44
Total Domestic Electricity Requirement[3]	136,000	491

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

NEB HIGH OIL PRICE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1995

SECTOR(1)		GW.h	PJ(2)
Residential		46,000	166
Commercial		38,000	137
Industrial		51,000	182
Transportation	- Road		
	- Rail		
	- Total	< 1,000	2
Other		2,000	7
Total		137,000	494
Utility Own Use and Losses		13,000	48
Total Domestic Electricity Requirement(3)		150,000	542

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

NEB HIGH OIL PRICE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 2000

SECTOR(1)	GW.h	PJ(2)
Residential	49,000	177
Commercial	43,000	156
Industrial	60,000	215
Transportation - Road		
- Rail		
- Total	1,000	3
Other	2,000	8
Total	155,000	559
Utility Own Use and Losses	15,000	53
Total Domestic Electricity Requirement(3)	170,000	612

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

NEB LOW OIL PRICE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1984

SECTOR(1)	GW.h	PJ(2)
Residential	36,000	131
Commercial	29,000	104
Industrial	37,000	132
Transportation - Road		
- Rail		
- Total	< 1,000	1
Other	2,000	7
Total	104,000	375
Utility Own Use and Losses	10,000	36
Total Domestic Electricity Requirement(3)	114,000	411

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

NEB LOW OIL PRICE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1985

SECTOR[1]	GW.h	PJ[2]
Residential	37,000	132
Commercial	29,000	106
Industrial	38,000	137
Transportation - Road		
- Rail		
- Total	<1,000	1
Other	2,000	7
Total	107,000	383
Utility Own Use and Losses	10,000	37
Total Domestic Electricity Requirement[3]	117,000	420

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

NEB LOW OIL PRICE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1986

SECTOR(1)	GW.h	PJ(2)
Residential	37,000	132
Commercial	30,000	108
Industrial	39,000	140
Transportation - Road		
- Rail		
- Total	<1,000	1
Other	2,000	7
Total	108,000	388
Utility Own Use and Losses	10,000	38
Total Domestic Electricity Requirement(3)	118,000	426

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

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FORM 8

NEB LOW OIL PRICE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1987

SECTOR(1)	GW.h	PJ(2)
Residential	37,000	133
Commercial	30,000	108
Industrial	40,000	144
Transportation - Road		
- Rail		
- Total	<1,000	1
Other	2,000	7
Total	109,000	393
Utility Own Use and Losses	11,000	38
Total Domestic Electricity Requirement(3)	120,000	431

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

NEB LOW OIL PRICE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1990

SECTOR(1)	GW.h	PJ(2)
Residential	39,000	139
Commercial	31,000	112
Industrial	43,000	154
Transportation - Road		
- Rail		
- Total	< 1,000	1
Other	2,000	8
Total	115,000	414
Utility Own Use and Losses	11,000	39
Total Domestic Electricity Requirement(3)	126,000	453

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

NEB LOW OIL PRICE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 1995

SECTOR[1]	GW.h	PJ[2]
Residential	42,000	152
Commercial	36,000	128
Industrial	50,000	181
Transportation - Road		
- Rail		
- Total	<1,000	2
Other	3,000	9
Total	131,000	471
Utility Own Use and Losses	12,000	44
Total Domestic Electricity Requirement[3]	143,000	515

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 8

NEB LOW OIL PRICE CASE

ELECTRICITY REQUIREMENTS BY SECTOR

(GW.h and PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

YEAR: 2000

SECTOR(1)		GW.h	PJ(2)
Residential		45,000	162
Commercial		40,000	143
Industrial		59,000	211
Transportation	- Road		
	- Rail		
	- Total	< 1,000	3
Other		3,000	10
Total		147,000	529
Utility Own Use and Losses		13,000	48
Total Domestic Electricity Requirement(3)		160,000	577

(1) Projections of energy use in GW.h should be indicated according to the sectors shown, including utility own use and losses.

(2) Convert GW.h to PJ using a factor of 3,600,000 joules per KW.h and enter in this column. Also enter same data under column (g) of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11).

(3) Enter Total Domestic Electricity Requirement in GW.h opposite (a) "Total Domestic Electricity Requirements" (GW.h) on FORECAST OF ELECTRICITY GENERATION (FORM 9).

FORM 9

BASE CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 106,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1982	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	41,000	428
Nuclear	33,000	344
Coal (by type)	29,000	290
Oil (by type)	1,000	6
Natural Gas	2,000	10
By-Product Fuels(5)	-	-
Exotic Fuels(6)	-	-

(1) This total should be copied directly from Form 8.
(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.
(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.
(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".
(5) Pulping liquor, hog fuels, bark, etc.
(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

BASE CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 111,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1983	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	40,000	420
Nuclear	38,000	400
Coal (by type)	30,000	295
Oil (by type)	<1,000	2
Natural Gas	2,000	10
By-Product Fuels(5)	-	-
Exotic Fuels(6)	-	-

(1) This total should be copied directly from Form 8.

(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.

(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.

(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".

(5) Pulping liquor, hog fuels, bark, etc.

(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

BASE CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ) BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 114,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1984	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	40,000	420
Nuclear	49,000	515
Coal (by type)	23,000	229
Oil (by type)	<1,000	2
Natural Gas	2,000	10
By-Product Fuels(5)	-	-
Exotic Fuels(6)	1,000	1

(1) This total should be copied directly from Form 8.
(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.
(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.
(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".
(5) Pulping liquor, hog fuels, bark, etc.
(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

BASE CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ) BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005   PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 117,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1985	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	40,000	420
Nuclear	51,000	537
Coal (by type)	23,000	232
Oil (by type)	<1,000	2
Natural Gas	2,000	10
By-Product Fuels(5)	-	-
Exotic Fuels(6)	<1,000	2

(1) This total should be copied directly from Form 8.
(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.
(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.
(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".
(5) Pulping liquor, hog fuels, bark, etc.
(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

BASE CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ) BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 119,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1986	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	40,000	420
Nuclear	57,000	598
Coal (by type)	19,000	192
Oil (by type)	<1,000	2
Natural Gas	2,000	10
By-Product Fuels(5)	-	-
Exotic Fuels(6)	<1,000	2

(1) This total should be copied directly from Form 8.

(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.

(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.

(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".

(5) Pulping liquor, hog fuels, bark, etc.

(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

BASE CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005   PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 121,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1987	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	40,000	420
Nuclear	61,000	645
Coal (by type)	17,000	170
Oil (by type)	<1,000	2
Natural Gas	2,000	10
By-Product Fuels(5)	-	-
Exotic Fuels(6)	<1,000	2

(1) This total should be copied directly from Form 8.
(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.
(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.
(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".
(5) Pulping liquor, hog fuels, bark, etc.
(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

BASE CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ) BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005   PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 129,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1990	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	40,000	420
Nuclear	71,000	745
Coal (by type)	15,000	151
Oil (by type)	<1,000	2
Natural Gas	2,000	10
By-Product Fuels(5)	-	-
Exotic Fuels(6)	<1,000	3

(1) This total should be copied directly from Form 8.

(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.

(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.

(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".

(5) Pulping liquor, hog fuels, bark, etc.

(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

BASE CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ) BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 145,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1995	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	43,000	445
Nuclear	80,000	840
Coal (by type)	18,000	184
Oil (by type)	<1,000	2
Natural Gas	3,000	15
By-Product Fuels(5)	-	-
Exotic Fuels(6)	<1,000	4

(1) This total should be copied directly from Form 8.
(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.
(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.
(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".
(5) Pulping liquor, hog fuels, bark, etc.
(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

BASE CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ) BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 164,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 2000	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	43,000	454
Nuclear	93,000	976
Coal (by type)	23,000	234
Oil (by type)	<1,000	1
Natural Gas	4,000	20
By-Product Fuels(5)	-	-
Exotic Fuels(6)	1,000	5

(1) This total should be copied directly from Form 8.

(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.

(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.

(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".

(5) Pulping liquor, hog fuels, bark, etc.

(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

NEB ECONOMIC GROWTH CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005   PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 114,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1984	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	40,000	420
Nuclear	49,000	515
Coal (by type)	23,000	230
Oil (by type)	<1,000	2
Natural Gas	2,000	10
By-Product Fuels(5)	-	-
Exotic Fuels(6)	<1,000	1

(1) This total should be copied directly from Form 8.
(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.
(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.
(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".
(5) Pulping liquor, hog fuels, bark, etc.
(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

NEB ECONOMIC GROWTH CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 118,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1985	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	40,000	420
Nuclear	52,000	546
Coal (by type)	23,000	232
Oil (by type)	<1,000	2
Natural Gas	2,000	10
By-Product Fuels(5)	-	-
Exotic Fuels(6)	<1,000	2

(1) This total should be copied directly from Form 8.

(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.

(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.

(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".

(5) Pulping liquor, hog fuels, bark, etc.

(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

NEB ECONOMIC GROWTH CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005   PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 121,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1986	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	40,000	420
Nuclear	57,000	598
Coal (by type)	22,000	214
Oil (by type)	<1,000	2
Natural Gas	2,000	10
By-Product Fuels(5)	-	-
Exotic Fuels(6)	<1,000	2

(1) This total should be copied directly from Form 8.
(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.
(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.
(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".
(5) Pulping liquor, hog fuels, bark, etc.
(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

NEB ECONOMIC GROWTH CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 125,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1987	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	40,000	420
Nuclear	66,000	690
Coal (by type)	17,000	170
Oil (by type)	<1,000	2
Natural Gas	2,000	10
By-Product Fuels(5)	-	-
Exotic Fuels(6)	<1,000	2

(1) This total should be copied directly from Form 8.

(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.

(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.

(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".

(5) Pulping liquor, hog fuels, bark, etc.

(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

NEB ECONOMIC GROWTH CASE

FORECAST OF ELECTRICITY GENERATION

(GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 136,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1990	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	40,000	420
Nuclear	76,000	797
Coal (by type)	16,000	168
Oil (by type)	<1,000	2
Natural Gas	3,000	15
By-Product Fuels(5)	-	-
Exotic Fuels(6)	1,000	4

(1) This total should be copied directly from Form 8.
(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.
(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.
(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".
(5) Pulping liquor, hog fuels, bark, etc.
(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

NEB ECONOMIC GROWTH CASE
FORECAST OF ELECTRICITY GENERATION

(GW.h) BY MAJOR FUEL TYPE AND PRIMARY

EQUIVALENT (PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 154,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1995

FUEL TYPE	Electricity Generated GW.h	Energy Input(4) PJ
Hydro	42,000	446
Nuclear	88,000	928
Coal (by type)	19,000	190
Oil (by type)	<1,000	2
Natural Gas	4,000	20
By-Product Fuels(5)	-	-
Exotic Fuels(6)	1,000	5

(1) This total should be copied directly from Form 8.
(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.
(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.
(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".
(5) Pulping liquor, hog fuels, bark, etc.
(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

NEB ECONOMIC GROWTH CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 174,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 2000	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	43,000	454
Nuclear	95,000	996
Coal (by type)	30,000	313
Oil (by type)	<1,000	1
Natural Gas	5,000	25
By-Product Fuels(5)	-	-
Exotic Fuels(6)	1,000	6

(1) This total should be copied directly from Form 8.

(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.

(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.

(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".

(5) Pulping liquor, hog fuels, bark, etc.

(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

NEB HIGH OIL PRICE CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 115,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1984	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	40,000	420
Nuclear	49,000	515
Coal (by type)	24,000	237
Oil (by type)	<1,000	2
Natural Gas	2,000	10
By-Product Fuels(5)	-	-
Exotic Fuels(6)	<1,000	1

(1) This total should be copied directly from Form 8.
(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.
(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.
(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".
(5) Pulping liquor, hog fuels, bark, etc.
(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

NEB HIGH OIL PRICE CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ) BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 118,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1985	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	40,000	420
Nuclear	51,000	537
Coal (by type)	25,000	247
Oil (by type)	<1,000	2
Natural Gas	2,000	10
By-Product Fuels(5)	-	-
Exotic Fuels(6)	<1,000	2

(1) This total should be copied directly from Form 8.

(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.

(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.

(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".

(5) Pulping liquor, hog fuels, bark, etc.

(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

NEB HIGH OIL PRICE CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 123,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1986	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	40,000	420
Nuclear	57,000	598
Coal (by type)	24,000	239
Oil (by type)	<1,000	2
Natural Gas	2,000	10
By-Product Fuels(5)	-	-
Exotic Fuels(6)	<1,000	2

(1) This total should be copied directly from Form 8.

(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.

(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.

(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".

(5) Pulping liquor, hog fuels, bark, etc.

(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

NEB HIGH OIL PRICE CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 128,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1987	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	40,000	420
Nuclear	68,000	710
Coal (by type)	18,000	179
Oil (by type)	<1,000	2
Natural Gas	2,000	10
By-Product Fuels(5)	-	-
Exotic Fuels(6)	<1,000	2

(1) This total should be copied directly from Form 8.

(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.

(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.

(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".

(5) Pulping liquor, hog fuels, bark, etc.

(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

NEB HIGH OIL PRICE CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 136,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1990	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	40,000	420
Nuclear	74,000	780
Coal (by type)	19,000	194
Oil (by type)	<1,000	2
Natural Gas	2,000	10
By-Product Fuels(5)	-	-
Exotic Fuels(6)	1,000	4

(1) This total should be copied directly from Form 8.

(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.

(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.

(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".

(5) Pulping liquor, hog fuels, bark, etc.

(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

NEB HIGH OIL PRICE CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 150,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1995	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	42,000	446
Nuclear	83,000	875
Coal (by type)	22,000	217
Oil (by type)	<1,000	1
Natural Gas	2,000	12
By-Product Fuels(5)	-	-
Exotic Fuels(6)	1,000	5

(1) This total should be copied directly from Form 8.
(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.
(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.
(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".
(5) Pulping liquor, hog fuels, bark, etc.
(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

NEB HIGH OIL PRICE CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 170,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 2000	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	43,000	454
Nuclear	95,000	996
Coal (by type)	28,000	281
Oil (by type)	<1,000	1
Natural Gas	3,000	15
By-Product Fuels(5)	-	-
Exotic Fuels(6)	1,000	6

(1) This total should be copied directly from Form 8.

(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.

(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.

(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".

(5) Pulping liquor, hog fuels, bark, etc.

(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

NEB LOW OIL PRICE CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 114,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1984	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	40,000	420
Nuclear	49,000	515
Coal (by type)	23,000	227
Oil (by type)	< 1,000	2
Natural Gas	2,000	10
By-Product Fuels(5)	-	-
Exotic Fuels(6)	-	-

(1) This total should be copied directly from Form 8.

(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.

(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.

(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".

(5) Pulping liquor, hog fuels, bark, etc.

(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

NEB LOW OIL PRICE CASE

FORECAST OF ELECTRICITY GENERATION

(GW.h) BY MAJOR FUEL TYPE AND PRIMARY

EQUIVALENT (PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 117,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1985	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	40,000	420
Nuclear	51,000	537
Coal (by type)	23,000	230
Oil (by type)	<1,000	2
Natural Gas	2,000	10
By-Product Fuels(5)	-	-
Exotic Fuels(6)	<1,000	1

(1) This total should be copied directly from Form 8.
(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.
(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.
(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".
(5) Pulping liquor, hog fuels, bark, etc.
(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

NEB LOW OIL PRICE CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 118,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1986	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	40,000	420
Nuclear	57,000	598
Coal (by type)	19,000	190
Oil (by type)	<1,000	2
Natural Gas	2,000	10
By-Product Fuels(5)	-	-
Exotic Fuels(6)	<1,000	1

(1) This total should be copied directly from Form 8.
(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.
(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.
(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".
(5) Pulping liquor, hog fuels, bark, etc.
(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

NEB LOW OIL PRICE CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 120,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1987	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	40,000	420
Nuclear	61,000	645
Coal (by type)	16,000	156
Oil (by type)	<1,000	2
Natural Gas	2,000	12
By-Product Fuels(5)	-	-
Exotic Fuels(6)	<1,000	1

(1) This total should be copied directly from Form 8.

(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.

(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.

(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".

(5) Pulping liquor, hog fuels, bark, etc.

(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

NEB LOW OIL PRICE CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 126,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1990	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	40,000	420
Nuclear	66,000	695
Coal (by type)	16,000	162
Oil (by type)	< 1,000	2
Natural Gas	3,000	15
By-Product Fuels(5)	-	-
Exotic Fuels(6)	<1,000	2

(1) This total should be copied directly from Form 8.

(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.

(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.

(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".

(5) Pulping liquor, hog fuels, bark, etc.

(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

NEB LOW OIL PRICE CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ)

BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005   PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 143,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 1995	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	42,000	446
Nuclear	78,000	823
Coal (by type)	18,000	180
Oil (by type)	<1,000	2
Natural Gas	4,000	20
By-Product Fuels(5)	-	-
Exotic Fuels(6)	<1,000	3

(1) This total should be copied directly from Form 8.
(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.
(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.
(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".
(5) Pulping liquor, hog fuels, bark, etc.
(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

FORM 9

NEB LOW OIL PRICE CASE

FORECAST OF ELECTRICITY GENERATION (GW.h) BY MAJOR FUEL TYPE AND PRIMARY EQUIVALENT (PJ) BY PROVINCE AND TERRITORY

FOR THE YEARS: 1982-1987, 1990, 1995, 2000, 2005 PROVINCE/TERRITORY: Ontario

(a) Total Domestic Electricity Requirements (GW.h)(1) 160,000

(b) Net Interprovincial Transfers (GW.h)(2) N/A

(c) Net International Export/Import (GW.h)(2) N/A

(d) Total Electricity Generated (GW.h)(3) N/A

Year: 2000	Electricity Generated GW.h	Energy Input(4) PJ
FUEL TYPE		
Hydro	43,000	454
Nuclear	92,000	962
Coal (by type)	20,000	202
Oil (by type)	<1,000	1
Natural Gas	4,000	25
By-Product Fuels(5)	-	-
Exotic Fuels(6)	1,000	4

(1) This total should be copied directly from Form 8.

(2) Best estimates including both firm and interruptible sales should be provided for Interprovincial and International Transfers.

(3) Distribute this total according to fuel type under column "Electricity Generated - GW.h" below.

(4) Convert GW.h to PJ using 10.5 megajoules per KW.h for hydro and nuclear and utility's own conversion factors for other fuels. (Please indicate factors used.) Enter Primary Energy Input in this column and also on Line 13 of PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND (FORM 11) opposite "Electricity Generation".

(5) Pulping liquor, hog fuels, bark, etc.

(6) Biomass, solar, wind, etc.

Note: Only generation to meet domestic requirements is estimated. These figures represent total generation less net exports and net interprovincial transfers.

BASE CASE
ONTARIO 1982
1 of 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas	Ethane	Propane	Butanes[1]	Oil Products	Natural Gas	Elec-tricity	Steam	Hog Fuel & Pulp Liq.	Other Renewable Energy	Hydro[2]	Nuclear[2]	Total Energy
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1. Residential	x		x	x	100	221	121			11			453
2. Commercial			x	x	48	140	100	x		x			288
3. Petrochemical		x	x	x	96	x							96
4. Other Industrial	177		x	x	96	276	124	36	59	x			768
5. Transportation - Road			x		x	x	x						
6. - Rail	x				x	x	x						x
7. - Air					x								x
8. - Marine					x								x
9 Total Transportation	x		1		552	x	1						554
10. Other Non Energy Use			x	x	57								57
11. TOTAL SECONDARY DEMAND	177	x	1	x	941	637	346	36	59	11			2208
12. Own Use & Losses	x	x	x	x	96	33	36						165
13. Electricity Generation	312				6	10			x	x	428	344	1100
14. Steam Production	x				1	x						45	46
15. TOTAL	489	x	1	x	1044	680	382	36	59	11	428	389	3519
16. Minus Total Electricity (col. g, row 15)							382						382
17. Minus Total Steam (col. h, row 15)								36					36
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. less Total Ethane Demand (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	489		1	x	1044	680			59	11	428	389	3101

Notes: (1) Excludes butane blended in gasoline.
(2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
(3) Includes coke and coke oven gas.

BASE CASE
ONTARIO 1983
1 of 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas (a)	Ethane (b)	Propane (c)	Butanes[1] (d)	Oil Products (e)	Natural Gas (f)	Elec-tricity (g)	Steam (h)	Hog Fuel & Pulp Liq. (i)	Other Renewable Energy (j)	Hydro (k)	Nuclear[2] (l)	Total Energy (m)
1. Residential	x		x	x	95	231	120			11			465
2. Commercial			x	x	40	141	102	x		x			283
3. Petrochemical		x	x	x	98	x							98
4. Other Industrial	189		x	x	109	295	127	36	59	x			815
5. Transportation - Road			x		x	x	x						x
6. - Rail	x				x	x	x						x
7. - Air					x								x
8. - Marine					x								x
9 Total Transportation	x		3		566	x	1						570
10. Other Non Energy Use					60								60
11. TOTAL SECONDARY DEMAND	189	x	3	x	968	667	358	36	59	11			2291
12. Own Use & Losses	x	x	x	x	100	35	43						178
13. Electricity Generation	298				2	10			x	x	420	400	1130
14. Steam Production	x				1	x						45	46
15. TOTAL	487	x	3	x	1071	712	401	36	59	11	420	445	3645
16. Minus Total Electricity (col. g, row 15)							401						401
17. Minus Total Steam (col. h, row 15)								36					36
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demand (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	487		3	x	1071	712			59	11	420	445	3208

Notes: (1) Excludes butane blended in gasoline.
(2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
(3) Includes coke and coke oven gas.

BASE CASE
ONTARIO 1984
1 of 2

FORM 11

PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas	Ethane	Propane	Butanes[1]	Oil Products	Natural Gas	Electricity	Steam	Hog Fuel & Pulp Liq.	Other Renewable Energy	Hydro[2]	Nuclear[2]	Total Energy
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1. Residential	x		x	x	90	217	131			12			470
2. Commercial			x	x	38	145	104	x		x			287
3. Petrochemical		x	x	x	100	x							100
4. Other Industrial	201		x	x	113	300	132	20	60	x			834
5. Transportation - Road			x		x	x	x						x
6. - Rail	x				x	x	x						x
7. - Air					x								x
8. - Marine					x								x
9 Total Transportation	x		5		559	x	1						565
10. Other Non Energy Use					60								60
11. TOTAL SECONDARY DEMAND	201	x	5	x	960	690	368	20	60	12			2316
12. Own Use & Losses	x	x	x	x	97	36	44						177
13. Electricity Generation	229				2	10			x	1	420	515	1177
14. Steam Production	x				1	x						25	26
15. TOTAL	430	x	5	x	1060	736	412	20	60	13	420	540	3696
16. Minus Total Electricity (col. g, row 15)							412						412
17. Minus Total Steam (col. h, row 15)								20					20
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demand (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	430		5	x	1060	736			60	13	420	540	3264

Notes: (1) Excludes butane blended in gasoline.
(2) Assuming 10 549 150 joules for each KWh of electricity generated and 1.25 joules for each joule of steam produced.
(3) Includes coke and coke oven gas.

BASE CASE
ONTARIO 1985
1 of 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas (a)	Ethane (b)	Propane (c)	Butanes[1] (d)	Oil Products (e)	Natural Gas (f)	Elec-tricity (g)	Steam (h)	Hog Fuel & Pulp Liq. (i)	Other Renewable Energy (j)	Hydro[2] (k)	Nuclear[2] (l)	Total Energy (m)
1. Residential	x		x	x	86	242	133			13			474
2. Commercial			x	x	36	148	106	x		x			290
3. Petrochemical		x	x	x	102	x							102
4. Other Industrial	207		x	x	114	317	137	16	60	x			851
5. Transportation - Road			x		x	x	x						x
6. - Rail	x				x	x	x						x
7. - Air					x								x
8. - Marine					x								x
9 Total Transportation	x		10		546	x	1						557
10. Other Non Energy Use					58								58
11. TOTAL SECONDARY DEMAND	207	x	10	x	942	707	377	16	60	13			2332
12. Own Use & Losses	x	x	x	x	96	29	44						169
13. Electricity Generation	232				2	10			x	2	420	537	1203
14. Steam Production	x				1	x						20	21
15. TOTAL	439	x	10	x	1041	746	421	16	60	15	420	557	3725
16. Minus Total Electricity (col. q, row 15)							421						421
17. Minus Total Steam (col. h, row 15)								16					16
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. less Total Ethane Demand (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	439		10	x	1041	746			60	15	420	557	3288

Notes: (1) Excludes butane blended in gasoline.
(2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
(3) Includes coke and coke oven gas.

BASE CASE
ONTARIO 1986
1 of 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas (a)	Ethane (b)	Propane (c)	Butanes^{1} (d)	Oil Products (e)	Natural Gas (f)	Elec- tricity (g)	Steam (h)	Hog Fuel & Pulp Liq. (i)	Other Renewable Energy (j)	Hydro^{2} (k)	Nuclear^{3} (l)	Total Energy (m)
1. Residential	x		x	x	78	247	134			13			472
2. Commercial			x	x	34	150	108	x		x			[illegible]
3. Petrochemical		x	x	x	104	x							104
4. Other Industrial	222		x	x	123	336	140	18	61	x			900
5. Transportation - Road			x		x	x	x						x
6. - Rail	x				x	x	x						x
7. - Air					x								x
8. - Marine					x								x
9 Total Transportation	x		12		542	x	1						555
10. Other Non Energy Use					61								61
11. TOTAL SECONDARY DEMAND	222	x	12	x	942	733	383	18	61	13			2384
12. Own Use & Losses	x	x	x	x	95	37	44						176
13. Electricity Generation	192				2	10			x	2	420	598	1224
14. Steam Production	x				1	x						22	[illegible]
15. TOTAL	414	x	12	x	1040	780	427	18	61	15	420	620	3807
16. Minus Total Electricity (col. g, row 15)							427						427
17. Minus Total Steam (col. h, row 15)								18					18
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. less Total Ethane Demand (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	414		12	x	1040	780			61	15	420	620	[illegible]

Notes: (1) Excludes butane blended in gasoline.
(2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
(3) Includes coke and coke oven gas.

BASE CASE
ONTARIO 1987
1 of 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas	Ethane	Propane	Butanes[1]	Oil Products	Natural Gas	Elec-tricity	Steam	Hog Fuel & Pulp Liq.	Other Renewable Energy	Hydro[2]	Nuclear[2]	Total Energy
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1. Residential	x		x	x	71	250	136			14			471
2. Commercial			x	x	32	152	109			x			293
3. Petrochemical		x	x	x	106	x		x					106
4. Other Industrial	230		x	x	120	341	144	16	62	x			914
5. Transportation - Road			x		x	x	x						x
6. - Rail	x				x	x	x						x
7. - Air					x								x
8. - Marine					x								x
9 Total Transportation	x		15		541	x	1						557
10. Other Non Energy Use					62								62
11. TOTAL SECONDARY DEMAND	230	x	15	x	932	743	390	16	62	14			2402
12. Own Use & Losses	x	x	x	x	94	39	45						178
13. Electricity Generation	170				2	10			x	2	420	645	1249
14. Steam Production	x				1	x						20	21
15. TOTAL	400	x	15	x	1029	792	435	16	62	16	420	665	3850
16. Minus Total Electricity (col. g, row 15)							435						435
17. Minus Total Steam (col. h, row 15)								16					16
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demand (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	400		15	x	1029	792			62	16	420	665	3399

Notes: (1) Excludes butane blended in gasoline.
(2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
(3) Includes coke and coke oven gas.

BASE CASE
ONTARIO 1990
1 of 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas (a)	Ethane (b)	Propane (c)	Butanes[1] (d)	Oil Products (e)	Natural Gas (f)	Electricity (g)	Steam (h)	Hog Fuel & Pulp Liq. (i)	Other Renewable Energy (j)	Hydro[2] (k)	Nuclear[2] (l)	Total Energy (m)
1. Residential	x		x	x	49	258	145			14			466
2. Commercial			x	x	26	155	116	x		x			297
3. Petrochemical		x	x	x	113	x							113
4. Other Industrial	250		x	x	130	409	154	16	66	x			1025
5. Transportation - Road			x		x	x	x						x
6. - Rail	x				x	x	x						x
7. - Air					x								x
8. - Marine					x								x
9 Total Transportation	x		29		537	x	1						567
10. Other Non Energy Use					69								69
11. TOTAL SECONDARY DEMAND	250	x	29	x	924	822	416	16	66	14			2537
12. Own Use & Losses	x	x	x	x	94	29	48						171
13. Electricity Generation	151				2	10			x	3	420	745	1331
14. Steam Production	x				1	x						20	21
15. TOTAL	401	x	29	x	1021	861	464	16	66	17	420	765	4060
16. Minus Total Electricity (col. g, row 15)							464						464
17. Minus Total Steam (col. h, row 15)								16					16
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demand (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	401		29	x	1021	861			66	17	420	765	3580

Notes: (1) Excludes butane blended in gasoline.
(2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
(3) Includes coke and coke oven gas.

BASE CASE
ONTARIO 1995
1 of 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas (a)	Ethane (b)	Propane (c)	Butanes[1] (d)	Oil Products (e)	Natural Gas (f)	Elec-tricity (g)	Steam (h)	Hog Fuel & Pulp Liq. (i)	Other Renewable Energy (j)	Hydro[2] (k)	Nuclear[2] (l)	Total Energy (m)
1. Residential	x		x	x	36	254	156			15			461
2. Commercial			x	x	21	167	134	x		2			324
3. Petrochemical		x	x	x	124	x							124
4. Other Industrial	277		x	x	136	433	177	16	69	2			1110
5. Transportation - Road			x		x	x	x						x
6. - Rail	x				x	x	x						x
7. - Air					x								x
8. - Marine					x								x
9 Total Transportation	x		50		552	x	2						604
10. Other Non Energy Use					71								71
11. TOTAL SECONDARY DEMAND	277	x	50	x	940	854	469	16	69	19			2694
12. Own Use & Losses	x	x	x	x	98	30	53						181
13. Electricity Generation	184				2	15			x	4	446	840	1491
14. Steam Production	x				1	x						20	21
15. TOTAL	461	x	50	x	1041	899	522	16	69	23	446	860	4387
16. Minus Total Electricity (col. g, row 15)							522						522
17. Minus Total Steam (col. h, row 15)								16					16
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demand (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	461		50	x	1041	899			69	23	446	860	3849

Notes: (1) Excludes butane blended in gasoline.
(2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
(3) Includes coke and coke oven gas.

BASE CASE
ONTARIO 2000
1 of 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas	Ethane	Propane	Butanes[1]	Oil Products	Natural Gas	Elec-tricity	Steam	Hog Fuel & Pulp Liq.	Other Renewable Energy	Hydro[2]	Nuclear[2]	Total Energy
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1. Residential	x		x	x	23	248	166			16			453
2. Commercial			x	x	17	174	154	x		3			348
3. Petrochemical		x	x	x	137	x							137
4. Other Industrial	310		x	x	145	490	209	16	78	3			1251
5. Transportation - Road			x		x	x	x						
6. - Rail	x				x	x	x						x
7. - Air					x								x
8. - Marine					x								x
9 Total Transportation	x		58		574	x	3						635
10. Other Non Energy Use					73								73
11. TOTAL SECONDARY DEMAND	310	x	58	x	969	912	532	16	78	22			2897
12. Own Use & Losses	x	x	x	x	100	31	59						190
13. Electricity Generation	234				1	20			x	5	454	976	1690
14. Steam Production	x				x	x						20	20
15. TOTAL	544	x	58	x	1070	963	591	16	78	27	454	996	4797
16. Minus Total Electricity (col. g, row 15)							591						591
17. Minus Total Steam (col. h, row 15)								16					16
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demand (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	544		58	x	1070	963			78	27	454	996	4190

Notes: (1) Excludes butane blended in gasoline.
(2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
(3) Includes coke and coke oven gas.

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ONTARIO 1984
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FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas	Ethane	Propane	Butanes[1]	Oil Products	Natural Gas	Elec-tricity	Steam	Hog Fuel & Pulp Liq.	Other Renewable Energy	Hydro[2]	Nuclear[2]	Total Energy
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1. Residential	x		x	x	90	217	131			12			470
2. Commercial			x	x	41	147	105	x		x			293
3. Petrochemical		x	x	x	103	x							103
4. Other Industrial	199		x	x	121	330	130	20	63	x			863
5. Transportation - Road			5		x	x	x						x
6. - Rail	x		x		x		x						x
7. - Air					x								x
8. - Marine					x								x
9. Total Transportation	x		5	x	575		1						581
10. Other Non Energy Use					61								61
11. TOTAL SECONDARY DEMAND	199		5		991	714	367	20	63	12			2371
12. Own Use & Losses	x	x	x	x	99	37	44						180
13. Electricity Generation	230				2	10			x	x	420	515	1177
14. Steam Production	x				1	x						25	26
15. TOTAL	429		5	x	1093	761	411	20	63	12	420	540	3754
16. Minus Total Electricity (cl. g, row 15)							411						411
17. Minus Total Steam (col.h, row 15)								20					20
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demane (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	429		5		1093	761			63	12	420	540	3323

Notes:
1) Excludes butanes blended in gasoline.
2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
3) Includes coke and coke oven gas.

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FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas	Ethane	Propane	Butanes[1]	Oil Products	Natural Gas	Elec-tricity	Steam	Hog Fuel & Pulp Liq.	Other Renewable Energy	Hydro[2]	Nuclear[2]	Total Energy
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1. Residential	x		x	x	86	243	133			13			475
2. Commercial			x	x	36	150	108	x		x			294
3. Petrochemical		x	x	x	102	x							102
4. Other Industrial	213		x	x	125	347	137	16	64	x			902
5. Transportation - Road			x		x	x	x						x
6. - Rail	x		x		x		x						x
7. - Air					x								x
8. - Marine					x								x
9. Total Transportation	x		10	x	571	x	1						582
10. Other Non Energy Use					59								59
11. TOTAL SECONDARY DEMAND	213		10		979	740	379	16	64	13			2414
12. Own Use & Losses	x	x	x	x	98	38	45						181
13. Electricity Generation	232				2	10			x	2	420	546	1212
14. Steam Production	x				1	x						20	21
15. TOTAL	445		10	x	1080	788	424	16	64	15	420	566	3828
16. Minus Total Electricity (cl. g, row 15)							424						424
17. Minus Total Steam (col.h, row 15)								16					16
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. less Total Ethane Demane (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	445		10		1080	788			64	15	420	566	3388

Notes:
1) Excludes butanes blended in gasoline.
2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
3) Includes coke and coke oven gas.

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FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas (a)	Ethane (b)	Propane (c)	Butanes[1] (d)	Oil Products (e)	Natural Gas (f)	Elec-tricity (g)	Steam (h)	Hog Fuel & Pulp Liq. (i)	Other Renewable Energy (j)	Hydro[2] (k)	Nuclear[2] (l)	Total Energy (m)
1. Residential	x		x	x	78	248	134			13			473
2. Commercial			x	x	35	152	110	x		x			297
3. Petrochemical		x	x	x	111	x							111
4. Other Industrial	235		x	x	131	375	145	18	65	x			969
5. Transportation - Road			x		x	x	x						x
6. - Rail	x		x		x		x						x
7. - Air					x								x
8. - Marine					x								x
9. Total Transportation	x		12	x	587	x	1						600
10. Other Non Energy Use					61								61
11. TOTAL SECONDARY DEMAND	235		12		1003	775	390	18	65	13			2511
12. Own Use & Losses	x	x	x	x	101	39	45						185
13. Electricity Generation	214				2	10			65	3	420	598	1312
14. Steam Production	x				1	x						22	23
15. TOTAL	449		12	x	1107	824	435	18	65	16	420	620	3966
16. Minus Total Electricity (cl. g, row 15)							435						435
17. Minus Total Steam (col.h, row 15)								18					18
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demane (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	449		12		1107	824			65	16	420	620	3513

Notes:
1) Excludes butanes blended in gasoline.
2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
3) Includes coke and coke oven gas.

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FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas	Ethane	Propane	Butanes[1]	Oil Products	Natural Gas	Elec-tricity	Steam	Hog Fuel & Pulp Liq.	Other Renewable Energy	Hydro[2]	Nuclear[2]	Total Energy
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1. Residential	x		x	x	71	251	136			14 ·			472
2. Commercial			x	x	34	154	112	x		x			300
3. Petrochemical		x	x	x	111	x							111
4. Other Industrial	248		x	x	131	388	154	16	66	x			1003
5. Transportation - Road			x		x	x	x						x
6. - Rail	x		x		x		x						x
7. - Air					x								x
8. - Marine					x								x
9. Total Transportation	x		16	x	584	x	1						601
10. Other Non Energy Use					61								61
11. TOTAL SECONDARY DEMAND	248		16		992	793	403	16	66	14			2548
12. Own Use & Losses	x	x	x	x	106	40	46						192
13. Electricity Generation	170				2	10			x	2	420	690	1294
14. Steam Production	x				1	x						20	21
15. TOTAL	418		16	x	1101	843	449	16	66	16	420	710	4055
16. Minus Total Electricity (cl. g, row 15)							449						449
17. Minus Total Steam (col.h, row 15)								16					16
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demane (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	418		16	x	1101	843			66	16	420	710	3590

Notes:
1) Excludes butanes blended in gasoline.
2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
3) Includes coke and coke oven gas.

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FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM

(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas	Ethane	Propane	Butanes[1]	Oil Products	Natural Gas	Elec-tricity	Steam	Hog Fuel & Pulp Liq.	Other Renewable Energy	Hydro[2]	Nuclear[2]	Total Energy
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1. Residential	x		x	x	49	260	145			14			468
2. Commercial			x	x	27	161	121	x		x			309
3. Petrochemical		x	x	x	122	x							122
4. Other Industrial	269		x	x	142	443	171	16	71	x			1112
5. Transportation - Road			x		x	x	x						x
6. - Rail	x		x		x		x						x
7. - Air					x								x
8. - Marine					x								x
9. Total Transportation	x		31	x	585	x	1						617
10. Other Non Energy Use					70								70
11. TOTAL SECONDARY DEMAND	269		31		995	864	438	16	71	14			2698
12. Own Use & Losses	x	x	x	x	100	42	50						192
13. Electricity Generation	168				2	10			x	3	420	797	1400
14. Steam Production	x				1	x						20	21
15. TOTAL	437		31	x	1098	916	488	16	71	17	420	817	4311
16. Minus Total Electricity (cl. g, row 15)							488						488
17. Minus Total Steam (col.h, row 15)								16					16
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demane (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	437		31	x	1098	916			71	17	420	817	3807

Notes:
1) Excludes butanes blended in gasoline.
2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
3) Includes coke and coke oven gas.

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FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas	Ethane	Propane	Butanes[1]	Oil Products	Natural Gas	Elec-tricity	Steam	Hog Fuel & Pulp Liq.	Other Renewable Energy	Hydro[2]	Nuclear[2]	Total Energy
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1. Residential	x		x	x	36	256	157			15			464
2. Commercial			x	x	21	172	139	x		2			334
3. Petrochemical		x	x	x	131	x							131
4. Other Industrial	303		x	x	153	482	199	16	72	2			1227
5. Transportation - Road			x		x	x	x						x
6. - Rail	x		x		x		x						x
7. - Air					x								x
8. - Marine					x								x
9. Total Transportation	x		54	x	591	x	2						647
10. Other Non Energy Use					72								72
11. TOTAL SECONDARY DEMAND	303		54		1004	910	497	16	72	19			2875
12. Own Use & Losses	x	x	x	x	100	39	56						195
13. Electricity Generation	190				2	20		x	x	4	446	928	1590
14. Steam Production	x				1	x						20	21
15. TOTAL	493		54	x	1107	969	553	16	72	23	446	948	4681
16. Minus Total Electricity (cl. g, row 15)							553						553
17. Minus Total Steam (col.h, row 15)								16					16
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demane (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	493		54	x	1107	969			72	23	446	948	4112

Notes: 1) Excludes butanes blended in gasoline.
2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
3) Includes coke and coke oven gas.

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FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas (a)	Ethane (b)	Propane (c)	Butanes^1 (d)	Oil Products (e)	Natural Gas (f)	Elec-tricity (g)	Steam (h)	Hog Fuel & Pulp Liq. (i)	Other Renewable Energy (j)	Hydro^2 (k)	Nuclear^2 (l)	Total Energy (m)
1. Residential	x		x	x	23	251	168			16			458
2. Commercial			x	x	17	178	158	x		3			356
3. Petrochemical		x	x	x	139	x							139
4. Other Industrial	340		x	x	166	539	235	16	81	4			1381
5. Transportation - Road			x		x	x	x						x
6. - Rail	x		x		x		x						x
7. - Air					x								x
8. - Marine					x								x
9. Total Transportation	x	x	60	x	600	x	3						663
10. Other Non Energy Use					74								74
11. TOTAL SECONDARY DEMAND	313		60	x	1019	968	564	16	81	23			3044
12. Own Use & Iosses	x	x	x	x	103	46	62						211
13. Electricity Generation	340				1	20		x	x	5	454	996	1816
14. Steam Production	x				x	x						20	20
15. TOTAL	653		60	x	1123	1034	626	16	81	28	454	1016	5091
16. Minus Total Electricity (cl. q, row 15)							626						626
17. Minus Total Steam (col.h, row 15)								16					16
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demane (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	653		60	x	1123	1034			81	28	454	1016	4449

Notes:
1) Excludes butanes blended in gasoline.
2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
3) Includes coke and coke oven gas.

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FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas	Ethane	Propane	Butanes[1]	Oil Products	Natural Gas	Elec-tricity	Steam	Hog Fuel & Pulp Liq.	Other Renewable Energy	Hydro[2]	Nuclear[2]	Total Energy
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1. Residential	x		x	x	90	237	131			12			470
2. Commercial			x	x	41	147	105	x		x			293
3. Petrochemical		x	x	x	100	x							100
4. Other Industrial	197		x	x	108	296	130	20	59	x			810
5. Transportation - Road			5		x	x	x						x
6. - Rail	x				x		x						x
7. - Air					x								x
8. - Marine					x								x
9 Total Transportation	x		5		559	x	1						565
10. Other Non Energy Use					61								61
11. TOTAL SECONDARY DEMAND	197	x	5	x	957	680	367	20	59	12			2,299
12. Own Use & Losses	x	x	x	x	96	35	44						175
13. Electricity Generation	237				12	10			x	1	420	515	1,185
14. Steam Production	x				1	x						25	26
15. TOTAL	434	x	5	x	1,058	725	411	20	59	13	420	540	3,685
16. Minus Total Electricity (col. g, row 15)							411						411
17. Minus Total Steam (col. h, row 15)								20					20
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demand (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	434		5	x	1,058	725	411		59	13	420	540	3,254

Notes:
(1) Excludes butane blended in gasoline.
(2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
(3) Includes coke and coke oven gas.

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FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas	Ethane	Propane	Butanes[1]	Oil Products	Natural Gas	Elec- tricity	Steam	Hog Fuel & Pulp Liq.	Other Renewable Energy	Hydro[2]	Nuclear[2]	Total Energy
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1. Residential	x		x	x	83	236	135			14			468
2. Commercial			x	x	36	146	108	x		x			290
3. Petrochemical		x	x	x	102	x							102
4. Other Industrial	207		x	x	114	317	137	16	60	x			851
5. Transportation - Road			x		x	x	x						x
6. - Rail	x		x		x		x						x
7. - Air					x								x
8. - Marine					x								x
9. Total Transportation	x		10	x	544	x	1						555
10. Other Non Energy Use					59								59
11. TOTAL SECONDARY DEMAND	207	x	10	x	938	699	381	16	60	14			2325
12. Own Use & Losses	x	x	x	x	94	36	45						175
13. Electricity Generation	247				2	10				2	420	537	1218
14. Steam Production	x				1	x						20	21
15. TOTAL	454		10	x	1035	745	426	16	60	16	420	557	3739
16. Minus Total Electricity (cl. g, row 15)							426						426
17. Minus Total Steam (col.h, row 15)								16					16
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demane (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	454		10	x	1035	745			60	16	420	557	3297

Notes:
1) Excludes butanes blended in gasoline.
2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
3) Includes coke and coke oven gas.

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FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM

(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas	Ethane	Propane	Butanes[1]	Oil Products	Natural Gas	Elec- tricity	Steam	Hog Fuel & Pulp Liq.	Other Renewable Energy	Hydro[2]	Nuclear[2]	Total Energy
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1. Residential	x		x	x	77	238	139			14			468
2. Commercial			x	x	33	140	112	x		x			285
3. Petrochemical		x	x	x	104	x							104
4. Other Industrial	215		x	x	115	326	145	18	61				880
5. Transportation - Road			13		x	x	x						x
6. - Rail	x		x		x		x						x
7. - Air					x								x
8. - Marine					x								x
9. Total Transportation	x		13		537	x	1						551
10. Other Non Energy Use					61								61
11. TOTAL SECONDARY DEMAND	215	x	13	x	927	704	397	18	61	14			2349
12. Own Use & Losses	x	x	x	x	92	36	47						175
13. Electricity Generation	239				2	10				2	420	598	1271
14. Steam Production	x				1	x						22	23
15. TOTAL	454		13	x	1022	750	444	18	61	16	420	620	3818
16. Minus Total Electricity (cl. g, row 15)							444						444
17. Minus Total Steam (col.h, row 15)								18					18
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demane (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	454		13	x	1022	750			61	16	420	620	3356

Notes:
1) Excludes butanes blended in gasoline.
2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
3) Includes coke and coke oven gas.

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FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas (a)	Ethane (b)	Propane (c)	Butanes[1] (d)	Oil Products (e)	Natural Gas (f)	Electricity (g)	Steam (h)	Hog Fuel & Pulp Liq. (i)	Other Renewable Energy (j)	Hydro[2] (k)	Nuclear[2] (l)	Total Energy (m)
1. Residential	x		x	x	70	240	143			14			467
2. Commercial			x	x	30	140	115	x		x			285
3. Petrochemical		x	x	x	106	x							106
4. Other Industrial	224		x	x	116	335	154	16	62	x			907
5. Transportation - Road			x		x	x	x						x
6. - Rail	x		x		x		x						x
7. - Air					x								x
8. - Marine					x								x
9. Total Transportation	x		16		532	x	1						549
10. Other Non Energy Use					62								62
11. TOTAL SECONDARY DEMAND	224	x	16	x	916	715	413	16	62	14			2376
12. Own Use & Losses	x	x	x	x	92	36	48						176
13. Electricity Generation	179				2	10			62	1	420	710	1384
14. Steam Production	x				1	x						20	21
15. TOTAL	403	x	16	x	1011	761	461	16	62	15	420	730	3895
16. Minus Total Electricity (cl. g, row 15)							461						461
17. Minus Total Steam (col.h, row 15)								16					16
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demane (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	403		16	x	1011	761			62	15	420	730	3418

Notes:
1) Excludes butanes blended in gasoline.
2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
3) Includes coke and coke oven gas.

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FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas	Ethane	Propane	Butanes[1]	Oil Products	Natural Gas	Elec- tricity	Steam	Hog Fuel & Pulp Liq.	Other Renewable Energy	Hydro[2]	Nuclear[2]	Total Energy
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1. Residential	x		x	x	43	245	153			15			456
2. Commercial			x	x	25	139	122	x		x			286
3. Petrochemical		x	x	x	113	x							113
4. Other Industrial	250		x	x	119	369	165	16	66	x			985
5. Transportation - Road			x		x	x	x						x
6. - Rail	x		x		x		x						x
7. - Air					x								x
8. - Marine					x								x
9. Total Transportation	x		32		515	x	1						548
10. Other Non Energy Use					69								69
11. TOTAL SECONDARY DEMAND	250	x	32	x	884	753	441	16	66	15			2457
12. Own Use & Losses	x	x	x	x	88	37	50						175
13. Electricity Generation	194				2	10				4	420	780	1410
14. Steam Production	x				1	x						20	21
15. TOTAL	444	x	32	x	975	800	491	16	66	19	420	800	4063
16. Minus Total Electricity (cl. g, row 15)							491						491
17. Minus Total Steam (col.h, row 15)								16					16
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demane (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	444		32	x	975	800			66	19	420	800	3556

Notes:
1) Excludes butanes blended in gasoline.
2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
3) Includes coke and coke oven gas.

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FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM

(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas (a)	Ethane (b)	Propane (c)	Butanes[1] (d)	Oil Products (e)	Natural Gas (f)	Elec- tricity (g)	Steam (h)	Hog Fuel & Pulp Liq. (i)	Other Renewable Energy (j)	Hydro[2] (k)	Nuclear[2] (l)	Total Energy (m)
1. Residential	x		x	x	30	239	166			17			452
2. Commercial			x	x	20	161	137	x		2			320
3. Petrochemical		x	x	x	124	x							124
4. Other Industrial	270		x	x	126	426	182	16	69	2			1091
5. Transportation - Road			x		x	x	x						x
6. - Rail	x		x		x		x						x
7. - Air					x								x
8. - Marine					x								x
9. Total Transportation	x		54		518	x	2						574
10. Other Non Energy Use					71								71
11. TOTAL SECONDARY DEMAND	270	x	54	x	889	826	487	16	69	21			2632
12. Own Use & Losses	x	x	x	x	89	42	55						186
13. Electricity Generation	217				1	10				5	446	875	1554
14. Steam Production	x				x	x						20	20
15. TOTAL	487	x	54	x	979	878	542	16	69	26	446	895	4392
16. Minus Total Electricity (cl. g, row 15)							542						542
17. Minus Total Steam (col.h, row 15)								16					16
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demane (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	487		54	x	979	878			69	26	446	895	3834

Notes:
1) Excludes butanes blended in gasoline.
2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
3) Includes coke and coke oven gas.

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FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas	Ethane	Propane	Butanes[1]	Oil Products	Natural Gas	Elec-tricity	Steam	Hog Fuel & Pulp Liq.	Other Renewable Energy	Hydro[2]	Nuclear[2]	Total Energy
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1. Residential	x		x	x	18	231	177			18			444
2. Commercial			x	x	15	170	156	x		3			344
3. Petrochemical		x	x	x	137	x							137
4. Other Industrial	302		x	x	135	482	215	16	77	4			1231
5. Transportation - Road			x		x	x	x						x
6. - Rail	x		x		x		x						x
7. - Air					x								x
8. - Marine					x								x
9. Total Transportation	x		60		539	x	3						602
10. Other Non Energy Use					73								73
11. TOTAL SECONDARY DEMAND	302	x	60	x	917	883	551	16	77	25			2831
12. Own Use & Losses	x	x	x	x	91	42	61						194
13. Electricity Generation	281				1	15				6	454	996	1753
14. Steam Production	x				x	x						20	20
15. TOTAL	583	x	60	x	1009	940	612	16	77	31	454	1016	4798
16. Minus Total Electricity (cl. g, row 15)							612						612
17. Minus Total Steam (col.h, row 15)								16					16
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demane (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	583		60	x	1009	940			77	31	454	1016	4170

Notes:
1) Excludes butanes blended in gasoline.
2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
3) Includes coke and coke oven gas.

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FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas (a)	Ethane (b)	Propane (c)	Butanes[1] (d)	Oil Products (e)	Natural Gas (f)	Elec- tricity (g)	Steam (h)	Hog Fuel & Pulp Liq. (i)	Other Renewable Energy (j)	Hydro[2] (k)	Nuclear[2] (l)	Total Energy (m)
1. Residential	x		x	x	90	237	131			12			470
2. Commercial			x	x	38	145	104	x		x			287
3. Petrochemical		x	x	x	100	x							100
4. Other Industrial	205		x	x	116	310	132	20	60	x			841
5. Transportation - Road			x			x	x						x
6. - Rail			x		x		x						x
7. - Air					x								x
8. - Marine					x								x
9. Total Transportation			5		559	x	1						565
10. Other Non Energy Use					61								61
11. TOTAL SECONDARY DEMAND	205	x	5	x	964	692	368	20	60	12			2326
12. Own Use & Losses	x	x	x	x	96	35	43						174
13. Electricity Generation	227				2	10			x	x	420	515	1174
14. Steam Production	x				1	x						25	26
15. TOTAL	432	x	5	x	1063	737	411	20	60	12	420	540	3700
16. Minus Total Electricity (col.g, row 15)							411						411
17. Minus Total Steam (col.h. row 15)								20					20
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demand (col.b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	432		5	x	1063	737			60	12	420	540	3269

Notes:
1) Excludes butanes blended in gasoline.
2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
3) Includes coke and coke oven gas.

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FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas (a)	Ethane (b)	Propane (c)	Butanes[1] (d)	Oil Products (e)	Natural Gas (f)	Elec-tricity (g)	Steam (h)	Hog Fuel & Pulp Liq. (i)	Other Renewable Energy (j)	Hydro[2] (k)	Nuclear[2] (l)	Total Energy (m)
1. Residential	x		x	x	88	244	132			13			477
2. Commercial			x	x	36	148	106	x		x			290
3. Petrochemical		x	x	x	102	x							102
4. Other Industrial	208		x	x	118	332	137	16	60	x			871
5. Transportation - Road			x		x	x	x						x
6. - Rail	x				x		x						x
7. - Air					x								x
8. - Marine					x								x
9 Total Transportation	x		10		547	x	1						558
10. Other Non Energy Use					59								59
11. TOTAL SECONDARY DEMAND	208	x	10	x	950	724	376	16	60	13			2,357
12. Own Use & Losses	x	x	x	x	95	37	44						176
13 Electricity Generation	230				2	10			x	1	420	537	1,200
14. Steam Production	x				1	x						20	21
15. TOTAL	438	x	10	x	1,048	771	420	16	60	14	420	557	3,754
16. Minus Total Electricity (col. g, row 15)							420						420
17 Minus Total Steam (col. h, row 15)								16					16
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demand (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	438		10	x	1,048	771			60	14	420	557	3,318

Notes:
(1) Excludes butane blended in gasoline.
(2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
(3) Includes coke and coke oven gas.

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FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas	Ethane	Propane	Butanes[1]	Oil Products	Natural Gas	Elec-tricity	Steam	Hog Fuel & Pulp Liq.	Other Renewable Energy	Hydro[2]	Nuclear[2]	Total Energy
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1. Residential	x		x	x	85	250	132			13			480
2. Commercial			x	x	35	153	108	x		x			296
3. Petrochemical		x	x	x	104	x							104
4. Other Industrial	229		x	x	122	356	140	18	61	x			926
5. Transportation - Road			x		x	x	x						x
6. - Rail	x				x		x						x
7. - Air					x								x
8. - Marine					x								x
9 Total Transportation	x		11		543	x	1						555
10. Other Non Energy Use					61								61
11. TOTAL SECONDARY DEMAND	229	x	11	x	950	759	381	18	61	13			2,422
12. Own Use & Losses	x	x	x	x	95	38	45						178
13 Electricity Generation	190				2	10			x	1	420	598	1,221
14. Steam Production	x				1	x						22	23
15. TOTAL	419	x	11	x	1,048	807	426	18	61	14	420	620	3,844
16. Minus Total Electricity (col. g, row 15)							426						426
17 Minus Total Steam (col. h, row 15)								18					18
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demand (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	419		11	x	1,048	807			61	14	420	620	3,402

Notes: (1) Excludes butane blended in gasoline.
(2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
(3) Includes coke and coke oven gas.

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FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas	Ethane	Propane	Butanes[1]	Oil Products	Natural Gas	Elec-tricity	Steam	Hog Fuel & Pulp Liq.	Other Renewable Energy	Hydro[2]	Nuclear[2]	Total Energy
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1. Residential	x		x	x	78	255	133			14			480
2. Commercial			x	x	33	157	108	x		x			298
3. Petrochemical		x	x	x	106	x							106
4. Other Industrial	237		x	x	125	367	144	16	62	x			951
5. Transportation - Road			x		x	x	x						x
6. - Rail	x				x		x						x
7. - Air					x								x
8. - Marine					x								x
9 Total Transportation	x		12		543	x	1						556
10. Other Non Energy Use					62								62
11. TOTAL SECONDARY DEMAND	237	x	12	x	947	779	386	16	62	14			2,453
12. Own Use & Losses	x	x	x	x	95	38	45						178
13. Electricity Generation	156				2	12			x	1	420	645	1,236
14. Steam Production	x				1	x						20	21
15. TOTAL	393	x	12	x	1,045	829	431	16	62	15	420	665	3,888
16. Minus Total Electricity (col. g, row 15)							431						431
17. Minus Total Steam (col. h, row 15)								16					16
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demand (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	393		12	x	1,045	829			62	15	420	665	3,441

Notes: (1) Excludes butane blended in gasoline.
(2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
(3) Includes coke and coke oven gas.

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FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas	Ethane	Propane	Butanes[1]	Oil Products	Natural Gas	Elec-tricity	Steam	Hog Fuel & Pulp Liq.	Other Renewable Energy	Hydro[2]	Nuclear[2]	Total Energy
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1. Residential	x		x	x	61	264	139			14			478
2. Commercial			x	x	27	165	112	x					304
3. Petrochemical		x	x	x	113	x							113
4. Other Industrial	249		x	x	134	406	154	16	66	x			1,025
5. Transportation - Road			x		x	x	x						x
6. - Rail	x				x		x						x
7. - Air					x								x
8. - Marine					x								x
9 Total Transportation	x		18		548	x	1						567
10. Other Non Energy Use					69								69
11. TOTAL SECONDARY DEMAND	249	x	18	x	952	835	406	16	66	14			2,556
12. Own Use & Losses	x	x	x	x	96	49	47						192
13. Electricity Generation	162				2	15			x	2	420	695	1,296
14. Steam Production	x				1	x						20	21
15. TOTAL	411	x	18	x	1,051	899	453	16	66	16	420	715	4,065
16. Minus Total Electricity (col. g, row 15)							453						453
17. Minus Total Steam (col. h, row 15)								16					16
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demand (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	411		18	x	1,051	899			66	16	420	715	3,596

Notes: (1) Excludes butane blended in gasoline.
(2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
(3) Includes coke and coke oven gas.

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NEB LOW OIL PRICE SCENARIO
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FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas	Ethane	Propane	Butanes[1]	Oil Products	Natural Gas	Elec-tricity	Steam	Hog Fuel & Pulp Liq.	Other Renewable Energy	Hydro[2]	Nuclear[2]	Total Energy
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1. Residential	x		x	x	41	266	152			14			473
2. Commercial			x	x	22	179	128	x		1			330
3. Petrochemical		x	x	x	124	x							124
4. Other Industrial	279		x	x	148	459	181	16	69	2			1,154
5. Transportation - Road			x		x	x	x						x
6. - Rail	x				x		x						x
7. - Air					x								x
8. - Marine					x								x
9 Total Transportation	x		19		592	x	2						613
10. Other Non Energy Use					71								71
11. TOTAL SECONDARY DEMAND	279	x	19	x	998	904	463	16	69	17			2,765
12. Own Use & Losses	x	x	x	x	100	35	53						188
13. Electricity Generation	180				2	20			x	3	446	823	1,474
14. Steam Production	x				1	x						20	21
15. TOTAL	459	x	19	x	1,101	959	516	16	69	20	446	843	4,448
16. Minus Total Electricity (col. g, row 15)							516						516
17. Minus Total Steam (col. h, row 15)								16					16
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demand (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	459		19	x	1,101	959			69	20	446	843	3,916

Notes: (1) Excludes butane blended in gasoline.
(2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
(3) Includes coke and coke oven gas.

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FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC ENERGY DEMAND BY SECTOR AND ENERGY FORM
(Unit: 10^{15} joules)

	Coal, Coke & Coke Oven Gas	Ethane	Propane	Butanes[1]	Oil Products	Natural Gas	Electricity	Steam	Hog Fuel & Pulp Liq.	Other Renewable Energy	Hydro[2]	Nuclear[2]	Total Energy
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1. Residential	x		x	x	28	260	162			15			465
2. Commercial			x	x	18	194	143	x		2			357
3. Petrochemical		x	x	x	137	x							137
4. Other Industrial	313		x	x	161	529	211	16	79	2			1,311
5. Transportation - Road			x		x	x	x						x
6. - Rail	x				x		x						x
7. - Air					x								x
8. - Marine					x								x
9 Total Transportation	x		21		628	x	3						652
10. Other Non Energy Use					73								73
11. TOTAL SECONDARY DEMAND	313	x	21	x	1,045	983	519	16	79	19			2,995
12. Own Use & Losses	x	x	x	x	105	47	58						210
13. Electricity Generation	202				1	25			x	4	454	962	1,648
14. Steam Production	x				x	x						20	20
15. TOTAL	515	x	21	x	1,151	1,055	577	16	79	23	454	982	4,873
16. Minus Total Electricity (col. g, row 15)							577						577
17. Minus Total Steam (col. h, row 15)								16					16
18. Plus Natural Gas Reprocessing Shrinkage						x							x
19. Less Total Ethane Demand (col. b, row 15)		x											x
20. TOTAL PRIMARY ENERGY	515		21	x	1,151	1,055			79	23	454	982	4,280

Notes: (1) Excludes butane blended in gasoline.
(2) Assuming 10 546 150 joules for each Kwh of electricity generated and 1.25 joules for each joule of steam produced.
(3) Includes coke and coke oven gas.

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BASE CASE
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FORM 11

PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT

(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	100					100
2. Commercial					x	40					40
3. Petrochemical									96		96
4. Other Industrial					x	96					96
5. Transportation - Road - Car		x			x						x
- Truck		x			x						x
- Other		x			x						
- Total		x			x						x
6. - Rail					x						x
7. - Air	x		x	x							x
8. - Marine					x	x					x
9. Total Transportation	1	414	44		82	11					552
10. Other Non Energy Use							57	x		x	57
11. TOTAL SECONDARY DEMAND	1	414	44		82	247	57	x	96	x	941
12. Own Use & Losses	x	x	x	x	x	96	x	x	x	x	96
13. Electricity Generation					x	6					6
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	1	414	44		82	350	57	x	96	x	1044

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).
(1) Light fuel oil and heavy fuel oil are not differentiated for the industrial, residential and commercial sectors.

BASE CASE
1983
2 OF 2

FORM 11

PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT

(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	95					95
2. Commercial					x	40					40
3. Petrochemical									98		98
4. Other Industrial					x	109					109
5. Transportation - Road - Car		297			5						302
- Truck		47			28						75
- Other		71			27						98
- Total		415			60						475
6. - Rail					26						26
7. - Air	1		37								38
8. - Marine					6	21					27
9. Total Transportation	1	415	37		92	21					566
10. Other Non Energy Use							60	x		x	60
11. TOTAL SECONDARY DEMAND	1	415	37		92	265	60	x	98	x	968
12. Own Use & Losses	x	x	x	x	x	100	x	x	x	x	100
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	1	415	37		92	368	60	x	98	x	1071

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).
(1) Light fuel oil and heavy fuel oil are not differentiated for the industrial, residential and commercial sectors.

BASE CASE
’984
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	90					90
2. Commercial					x	38					38
3. Petrochemical									100		100
4. Other Industrial					x	113					113
5. Transportation - Road - Car		284			6						290
- Truck		49			30						79
- Other		71			28						99
- Total		404			64						467
6. - Rail					27						27
7. - Air	1		36								37
8. - Marine					6	22					28
9. Total Transportation	1	404	36		97	22					559
10. Other Non Energy Use							60	x		x	60
11. TOTAL SECONDARY DEMAND	1	404	36		97	263	60	x	100	x	960
12. Own Use & Losses	x	x	x	x	x	97	x	x	x	x	97
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	1	404	36		97	363	60	x	100	x	1060

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).
(1) Light fuel oil and heavy fuel oil are not differentiated for the industrial, residential and commercial sectors.

BASE CASE
1985
2 OF 2

FORM 11

PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT

(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	86					86
2. Commercial					x	36					36
3. Petrochemical									102		102
4. Other Industrial					x	114					114
5. Transportation - Road - Car		273			7						280
- Truck		49			31						80
- Other		68			27						95
- Total		390			65						454
6. - Rail					27						27
7. - Air	1		36								37
8. - Marine					6	22					28
9. Total Transportation	1	390	36		98	22					546
10. Other Non Energy Use							58	x		x	58
11. TOTAL SECONDARY DEMAND	1	390	36		98	258	58	x	102	x	942
12. Own Use & Losses	x	x	x	x	x	96	x	x	x	x	96
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	1	390	36		98	357	58	x	102	x	1041

Notes: Column (1) "Total Oil Products" to be carried over to page 1, Column (e).
(1) Light fuel oil and heavy fuel oil are not differentiated for the industrial, residential and commercial sectors.

BASE CASE
1986
2 OF 2

FORM 11

PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT

(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	78					78
2. Commercial					x	34					34
3. Petrochemical									104		104
4. Other Industrial					x	123					123
5. Transportation - Road - Car		265			7						272
- Truck		50			32						82
- Other		66			28						94
- Total		381			67						448
6. - Rail					28						28
7. - Air	1			36							37
8. - Marine					6	23					29
9. Total Transportation	1	381		36	101	23					542
10. Other Non Energy Use							61	x		x	61
11. TOTAL SECONDARY DEMAND	1	381		36	101	258	61	x	104	x	942
12. Own Use & Losses	x	x	x	x	x	95	x	x	x	x	95
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	1	381		36	101	356	61	x	104	x	1040

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).
(1) Light fuel oil and heavy fuel oil are not differentiated for the industrial, residential and commercial sectors.

BASE CASE
1987
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	71					71
2. Commercial					x	32					32
3. Petrochemical									106		106
4. Other Industrial					x	120					120
5. Transportation - Road - Car		259			8						267
- Truck		53			34						87
- Other		65			28						93
- Total		377			70						447
6. - Rail					28						28
7. - Air	1		36								37
8. - Marine					6	23					29
9. Total Transportation	1	377	36		104	23					541
10. Other Non Energy Use							62	x		x	62
11. TOTAL SECONDARY DEMAND	1	377	36		104	246	62	x	106	x	932
12. Own Use & Losses	x	x	x	x	x	94	x	x	x	x	94
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	1	377	36		104	343	62	x	106	x	1029

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).
(1) Light fuel oil and heavy fuel oil are not differentiated for the industrial, residential and commercial sectors.

BASE CASE
1990
2 OF 2

FORM 11

PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT

(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	49					49
2. Commercial					x	26					26
3. Petrochemical									113		113
4. Other Industrial					x	130					130
5. Transportation - Road - Car		239			10						249
- Truck		56			39						95
- Other		66			29						95
- Total		361			78						439
6. - Rail					30						30
7. - Air	1		36								37
8. - Marine					7	24					31
9. Total Transportation	1	361	36		115	24					537
10. Other Non Energy Use							69	x		x	69
11. TOTAL SECONDARY DEMAND	1	361	36		115	229	69	x	113	x	924
12. Own Use & Losses	x	x	x	x	x	94	x	x	x	x	94
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	1	361	36		115	326	69	x	113	x	1021

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).
(1) Light fuel oil and heavy fuel oil are not differentiated for the industrial, residential and commercial sectors.

BASE CASE
1995
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT

(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	36					36
2. Commercial					x	21					21
3. Petrochemical									124		124
4. Other Industrial					x	136					136
5. Transportation - Road - Car		231			15						246
- Truck		59			47						106
- Other		61			32						93
- Total		351			94						445
6. - Rail					34						34
7. - Air	1		39								40
8. - Marine					7	26					33
9. Total Transportation	1	351	39		135	26					552
10. Other Non Energy Use							71	x		x	71
11. TOTAL SECONDARY DEMAND	1	351	39		135	219	71	x	124	x	940
12. Own Use & Losses	x	x	x	x	x	98	x	x	x	x	98
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	1	351	39		135	320	71	x	124	x	1041

Notes: Column (1) "Total Oil Products" to be carried over to page 1, Column (e).
(1) Light fuel oil and heavy fuel oil are not differentiated for the industrial, residential and commercial sectors.

BASE CASE
2000
2 OF 2

FORM 11

PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS (a)	MOGAS (b)	AVJET-A (c)	AVJET-B (d)	Diesel (e)	Fuel Oil (f)	Asphalt (g)	Lubes & Greases (h)	Petrochem. Feedstock (i)	Other Products (j)	Total Oil Products (k)
1. Residential					x	23					23
2. Commercial					x	17					17
3. Petrochemical									137		137
4. Other Industrial					x	145					145
5. Transportation - Road - Car		220			22						242
- Truck		65			56						121
- Other		62			36						98
- Total		347			114						461
6. - Rail					37						37
7. - Air	1		39								40
8. - Marine					7	29					36
9. Total Transportation	1	347	39		158	29					574
10. Other Non Energy Use							73	x		x	73
11. TOTAL SECONDARY DEMAND	1	347	39		158	214	73	x	137	x	969
12. Own Use & Losses	x	x	x	x	x	100	x	x	x	x	100
13. Electricity Generation					x	1					1
14. Steam Production						x					x
15. TOTAL PRIMARY OIL	1	347	39		158	315	73	x	137	x	1070

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).
(1) Light fuel oil and heavy fuel oil are not differentiated for the industrial, residential and commercial sectors.

NEB ECONOMIC GROWTH SCENARIO
1984
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	90					90
2. Commercial					x	41					41
3. Petrochemical									103		103
4. Other Industrial					x	121					121
5. Transportation - Road - Car		292			6						298
- Truck		50			31						81
- Other		71			28						99
- Total		413			65						478
6. - Rail					27						27
7. - Air	2		40								42
8. - Marine					6	22					28
9. Total Transportation	2	413	40		98	22					575
10. Other Non Energy Use							61	x		x	61
11. TOTAL SECONDARY DEMAND	2	413	40		98	274	61	x	103	x	991
12. Own Use & Losses	x	x	x	x	x	99	x	x	x	x	99
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	2	413	40		98	376	61	x	103	x	1093

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).

MEB ECONOMIC GROWTH SCENARIO
1985
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	86					86
2. Commercial					x	36					36
3. Petrochemical									102		102
4. Other Industrial					x	125					125
5. Transportation - Road - Car		285			7						292
- Truck		51			32						83
- Other		68			28						96
- Total		404			67						471
6. - Rail					28						28
7. - Air	2		41								43
8. - Marine					6	23					29
9. Total Transportation	2	404	41		101	23					571
10. Other Non Energy Use							59	x		x	59
11. TOTAL SECONDARY DEMAND	2	404	41		101	270	59	x	102	x	979
12. Own Use & Losses	x	x	x	x	x	98	x	x	x	x	98
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	2	404	41		101	371	59	x	102	x	1080

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).

NEB ECONOMIC GROWTH SCENARIO
1986
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	78					78
2. Commercial					x	35					35
3. Petrochemical									111		111
4. Other Industrial					x	131					131
5. Transportation - Road - Car		286			8						294
- Truck		54			35						89
- Other		68			28						96
- Total		408			71						481
6. - Rail					30						30
7. - Air	2		46								48
8. - Marine					6	24					30
9. Total Transportation	2	408	46		107	24					587
10. Other Non Energy Use							61	x		x	61
11. TOTAL SECONDARY DEMAND	2	408	46		107	268	61	x	111	x	1003
12. Own Use & Losses	x	x	x	x	x	101	x	x	x	x	101
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	2	408	46		107	372	61	x	111	x	1107

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).

NEB ECONOMIC GROWTH SCENARIO
1987
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	71					71
2. Commercial					x	34					34
3. Petrochemical									111		111
4. Other Industrial					x	131					131
5. Transportation - Road - Car		278			9						287
- Truck		56			36						92
- Other		67			30						97
- Total		401			75						476
6. - Rail					30						30
7. - Air	2		46								48
8. - Marine					6	24					30
9. Total Transportation	2	401	46		111	24					584
10. Other Non Energy Use							61	x		x	61
11. TOTAL SECONDARY DEMAND	2	401	46		111	260	61	x	111	x	992
12. Own Use & Losses	x	x	x	x	x	106	x	x	x	x	106
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	2	401	46		111	369	61	x	111	x	1101

Notes: Column (1) "Total Oil Products" to be carried over to page 1, Column (e).

NEB ECONOMIC GROWTH SCENARIO
1990
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	49					49
2. Commercial					x	27					27
3. Petrochemical									122		122
4. Other Industrial					x	142					142
5. Transportation - Road - Car		261			11						272
- Truck		61			42						103
- Other		67			30						97
- Total		389			83						472
6. - Rail					32						32
7. - Air	2		46								48
8. - Marine					7	26					33
9. Total Transportation	2	389	46		122	26					585
10. Other Non Energy Use							70	x		x	70
11. TOTAL SECONDARY DEMAND	2	389	46		122	244	70	x	122	x	995
12. Own Use & Losses	x	x	x	x	x	100	x	x	x	x	100
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	2	389	46		122	347	70	x	122	x	1098

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).

NEB ECONOMIC GROWTH SCENARIO
1995
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	36					36
2. Commercial					x	21					21
3. Petrochemical									131		131
4. Other Industrial					x	153					153
5. Transportation - Road - Car		247			17						264
- Truck		63			50						113
- Other		61			32						93
- Total		371			99						470
6. - Rail					36						36
7. - Air	2		48								50
8. - Marine					7	28					35
9. Total Transportation	2	371	48		142	28					591
10. Other Non Energy Use							72	x		x	72
11. TOTAL SECONDARY DEMAND	2	371	48		142	238	72	x	131	x	1004
12. Own Use & Losses	x	x	x	x	x	100	x	x	x	x	100
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	2	371	48		142	341	72	x	131	x	1107

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).

NEB ECONOMIC GROWTH SCENARIO
2000
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	23					23
2. Commercial					x	17					17
3. Petrochemical									139		139
4. Other Industrial					x	166					166
5. Transportation - Road - Car		230			23						253
- Truck		68			59						127
- Other		62			36						98
- Total		360			118						478
6. - Rail					38						38
7. - Air	2		44								46
8. - Marine					8	30					38
9. Total Transportation	2	360	44		164	30					600
10. Other Non Energy Use							74	x		x	74
11. TOTAL SECONDARY DEMAND	2	360	44		164	236	74	x	139	x	1019
12. Own Use & Losses	x	x	x	x	x	103	x	x	x	x	103
13. Electricity Generation					x	1					1
14. Steam Production						x					x
15. TOTAL PRIMARY OIL	2	360	44		164	340	74	x	139	x	1123

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).

HIGH OIL PRICE SCENARIO
1984
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	90					90
2. Commercial					x	41					41
3. Petrochemical									100		100
4. Other Industrial					x	108					108
5. Transportation - Road - Car		284			6						290
- Truck		49			30						79
- Other		71			27						98
- Total		404			63						467
6. - Rail					27						27
7. - Air	1			36							37
8. - Marine					6	22					28
9. Total Transportation	1	404		36	96	22					559
10. Other Non Energy Use							61	x		x	61
11. TOTAL SECONDARY DEMAND	1	404		36	96	261	61	x	100	x	959
12. Own Use & Losses	x	x	x	x	x	96	x	x	x	x	96
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	1	404		36	96	360	61	x	100	x	1058

Notes: Column (1) "Total Oil Products" to be carried over to page 1, Column (e).

HIGH OIL PRICE SCENARIO
1985
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	83					83
2. Commercial					x	36					36
3. Petrochemical									102		102
4. Other Industrial					x	114					114
5. Transportation - Road - Car		271			7						278
- Truck		49			31						80
- Other		68			27						95
- Total		388			65						453
6. - Rail					27						27
7. - Air	1		35								36
8. - Marine					6	22					28
9. Total Transportation	1	388	35		98	22					544
10. Other Non Energy Use							59	x		x	59
11. TOTAL SECONDARY DEMAND	1	388	35		98	255	59	x	102	x	938
12. Own Use & Losses	x	x	x	x	x	94	x	x	x	x	94
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	1	388	35		98	352	59	x	102	x	1035

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).

HIGH OIL PRICE SCENARIO
1986
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	77					77
2. Commercial					x	33					33
3. Petrochemical									104		104
4. Other Industrial					x	115					115
5. Transportation - Road - Car		260			7						267
- Truck		50			32						82
- Other		67			28						95
- Total		377			67						444
6. - Rail					28						28
7. - Air	1		35								36
8. - Marine					6	23					29
9. Total Transportation	1	377	35		101	23					537
10. Other Non Energy Use							61	x		x	61
11. TOTAL SECONDARY DEMAND	1	377	35		101	248	61	x	104	x	927
12. Own Use & Losses	x	x	x	x	x	92	x	x	x	x	92
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	1	377	35		101	343	61	x	104	x	1022

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).

HIGH OIL PRICE SCENARIO
1987
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	70					70
2. Commercial					x	30					30
3. Petrochemical									106		106
4. Other Industrial					x	116					116
5. Transportation - Road - Car		252			8						260
- Truck		52			34						86
- Other		66			28						94
- Total		370			70						440
6. - Rail					28						28
7. - Air	1		34								35
8. - Marine					6	23					29
9. Total Transportation	1	370	34		104	23					532
10. Other Non Energy Use							62	x		x	62
11. TOTAL SECONDARY DEMAND	1	370	34		104	239	62	x	106	x	916
12. Own Use & Losses	x	x	x	x	x	92	x	x	x	x	92
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	1	370	34		104	334	62	x	106	x	1011

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).

HIGH OIL PRICE SCENARIO
1990
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	43					43
2. Commercial					x	25					25
3. Petrochemical									113		113
4. Other Industrial					x	119					119
5. Transportation - Road - Car		222			10						232
- Truck		55			38						93
- Other		65			29						94
- Total		342			77						419
6. - Rail					31						31
7. - Air	1		34								35
8. - Marine					6	24					30
9. Total Transportation	1	342	34		114	24					515
10. Other Non Energy Use							69	x		x	69
11. TOTAL SECONDARY DEMAND	1	342	34		114	211	69	x	113	x	884
12. Own Use & Losses	x	x	x	x	x	88	x	x	x	x	88
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	1	342	34		114	302	69	x	113	x	975

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).

HIGH OIL PRICE SCENARIO
1995
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	30					30
2. Commercial					x	20					20
3. Petrochemical									124		124
4. Other Industrial					x	126					126
5. Transportation - Road - Car		203			14						217
- Truck		58			47						105
- Other		59			31						90
- Total		320			92						412
6. - Rail					34						34
7. - Air	1			38							39
8. - Marine					7	26					33
9. Total Transportation	1	320		38	133	26					518
10. Other Non Energy Use							71	x		x	71
11. TOTAL SECONDARY DEMAND	1	320		38	133	202	71	x	124	x	889
12. Own Use & Losses					x	89	x	x	x	x	89
13. Electricity Generation					x	1					1
14. Steam Production						x					x
15. TOTAL PRIMARY OIL	1	320		38	133	292	71	x	124	x	979

Notes: Column (1) "Total Oil Products" to be carried over to page 1, Column (e).

HIGH OIL PRICE SCENARIO
2000
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	18					18
2. Commercial					x	15					15
3. Petrochemical									137		137
4. Other Industrial					x	135					135
5. Transportation - Road - Car		191			20						211
- Truck		64			55						119
- Other		62			35						97
- Total		317			110						427
6. - Rail					37						37
7. - Air	1			38							39
8. - Marine					7	29					36
9. Total Transportation	1	317		38	154	29					539
10. Other Non Energy Use							73	x		x	73
11. TOTAL SECONDARY DEMAND	1	317		38	154	197	73	x	137	x	917
12. Own Use & Losses	x	x	x	x	x	91	x	x	x	x	91
13. Electricity Generation					x	1					1
14. Steam Production						x					x
15. TOTAL PRIMARY OIL	1	317		38	154	289	73	x	137	x	1009

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).

LOW OIL PRICE SCENARIO
1984
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	90					90
2. Commercial					x	38					38
3. Petrochemical									100		100
4. Other Industrial					x	116					116
5. Transportation - Road - Car		280			6						286
- Truck		49			30						79
- Other		75			27						102
- Total		404			63						467
6. - Rail					27						27
7. - Air	1		36								37
8. - Marine					6	22					28
9. Total Transportation	1	404	36		96	22					559
10. Other Non Energy Use							61	x		x	61
11. TOTAL SECONDARY DEMAND	1	404	36		96	266	61	x	100	x	964
12. Own Use & Losses	x	x	x	x	x	96	x	x	x	x	96
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	1	404	36		96	365	61	x	100	x	1063

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).
(1) Own Use & Losses not distributed among products.
(2) Petroleum products are not broken out except in the transportation sector.
(3) Other Non Energy Use is not separated out by product.

LOW OIL PRICE SCENARIO
1985
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	88					88
2. Commercial					x	36					36
3. Petrochemical									102		102
4. Other Industrial					x	118					118
5. Transportation - Road - Car		273			7						280
- Truck		49			31						80
- Other		68			27						95
- Total		390			65						455
6. - Rail					27						27
7. - Air	1		36								37
8. - Marine					6	22					28
9. Total Transportation	1	390	36		98	22					547
10. Other Non Energy Use							59	x		x	59
11. TOTAL SECONDARY DEMAND	1	390	36		98	264	59	x	102	x	950
12. Own Use & Losses	x	x	x	x	x	95	x	x	x	x	95
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	1	390	36		98	362	59	x	102	x	1048

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).
(1) Own Use & Losses not distributed among products.
(2) Petroleum products are not broken out except in the transportation sector.
(3) Other Non Energy Use is not separated out by product.

LOW OIL PRICE SCENARIO
1986
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	85					85
2. Commercial					x	35					35
3. Petrochemical									104		104
4. Other Industrial					x	122					122
5. Transportation - Road - Car		265			7						272
- Truck		51			32						83
- Other		66			28						94
- Total		382			67						449
6. - Rail					28						28
7. - Air	1		36								37
8. - Marine					6	23					29
9. Total Transportation	1	382	36		101	23					543
10. Other Non Energy Use							61	x		x	61
11. TOTAL SECONDARY DEMAND	1	382	36		101	265	61	x	104	x	950
12. Own Use & Losses	x	x	x	x	x	95	x	x	x	x	95
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	1	382	36		101	363	61	x	104	x	1048

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).
(1) Own Use & Losses not distributed among products.
(2) Petroleum products are not broken out except in the transportation sector.
(3) Other Non Energy Use is not separated out by product.

LOW OIL PRICE SCENARIO
1987
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	78					78
2. Commercial					x	33					33
3. Petrochemical									106		106
4. Other Industrial					x	125					125
5. Transportation - Road - Car		258			8						266
- Truck		52			34						86
- Other		68			29						97
- Total		378			71						449
6. - Rail					28						28
7. - Air	1		36								37
8. - Marine					6	23					29
9. Total Transportation	1	378	36		105	23					543
10. Other Non Energy Use							62	x		x	62
11. TOTAL SECONDARY DEMAND	1	378	36		105	259	62	x	106	x	947
12. Own Use & Losses	x	x	x	x	x	95	x	x	x	x	95
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	1	378	36		105	357	62	x	106	x	1045

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).
(1) Own Use & Losses not distributed among products.
(2) Petroleum products are not broken out except in the transportation sector.
(3) Other Non Energy Use is not separated out by product.

LOW OIL PRICE SCENARIO
1990
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	61					61
2. Commercial					x	27					27
3. Petrochemical									113		113
4. Other Industrial					x	134					134
5. Transportation - Road - Car		247			10						257
- Truck		57			39						96
- Other		66			32						98
- Total		370			81						451
6. - Rail					30						30
7. - Air	1		36								37
8. - Marine					6	24					30
9. Total Transportation	1	370	36		117	24					548
10. Other Non Energy Use							69	x		x	69
11. TOTAL SECONDARY DEMAND	1	370	36		117	246	69	x	113	x	952
12. Own Use & Losses	x	x	x	x	x	96	x	x	x	x	96
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	1	370	36		117	345	69	x	113	x	1051

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).
(1) Own Use & Losses not distributed among products.
(2) Petroleum products are not broken out except in the transportation sector.
(3) Other Non Energy Use is not separated out by product.

LOW OIL PRICE SCENARIO
1995
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	41					41
2. Commercial					x	22					22
3. Petrochemical									124		124
4. Other Industrial					x	148					148
5. Transportation - Road - Car		253			15						268
- Truck		63			48						111
- Other		67			36						103
- Total		382			99						481
6. - Rail					34						34
7. - Air	2		41								43
8. - Marine					7	27					34
9. Total Transportation	2	382	41		140	27					592
10. Other Non Energy Use							71	x		x	71
11. TOTAL SECONDARY DEMAND	2	382	41		140	238	71	x	124	x	998
12. Own Use & Losses	x	x	x	x	x	100	x	x	x	x	100
13. Electricity Generation					x	2					2
14. Steam Production						1					1
15. TOTAL PRIMARY OIL	2	382	41		140	341	71	x	124	x	1101

Notes: Column (1) "Total Oil Products" to be carried over to page 1, Column (e).
(1) Own Use & Losses not distributed among products.
(2) Petroleum products are not broken out except in the transportation sector.
(3) Other Non Energy Use is not separated out by product.

LOW OIL PRICE SCENARIO
2000
2 OF 2

FORM 11
PRO FORMA MATRIX OF TOTAL DOMESTIC PETROLEUM PRODUCTS DEMAND BY SECTOR AND PRODUCT
(Unit: 10^{15} joules)

	AVGAS	MOGAS	AVJET-A	AVJET-B	Diesel	Fuel Oil	Asphalt	Lubes & Greases	Petrochem. Feedstock	Other Products	Total Oil Products
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Residential					x	28					28
2. Commercial					x	18					18
3. Petrochemical									137		137
4. Other Industrial					x	161					161
5. Transportation - Road - Car		251			23						274
- Truck		69			57						126
- Other		71			34						105
- Total		390			114						504
6. - Rail					37						37
7. - Air	2			42							44
8. - Marine					14	29					43
9. Total Transportation	2	390		42	165	29					628
10. Other Non Energy Use							73	x		x	73
11. TOTAL SECONDARY DEMAND	2	390		42	165	236	73	x	137	x	1045
12. Own Use & Losses	x	x	x	x	x	105	x	x	x	x	105
13. Electricity Generation					x	1					1
14. Steam Production						x					x
15. TOTAL PRIMARY OIL	2	390		42	165	342	73	x	137	x	1151

Notes: Column (l) "Total Oil Products" to be carried over to page 1, Column (e).
(1) Own Use & Losses not distributed among products.
(2) Petroleum products are not broken out except in the transportation sector.
(3) Other Non Energy Use is not separated out by product.

NOTES TO NEB FORMS

FORM 11 page 1

(1) Propane includes other alternative transportation fuels

(2) Ethane, Propane and Butane use is not separated out from Oil Products and Natural Gas except in the Transportation Sector.

FORM 11 page 2

(1) No breakout for AVJET-A and AVJET-B fuel

(2) No breakout for Light Fuel Oil and Heavy Fuel Oil

(3) Asphalt includes Lubes and Greases and Other Products

Ontario

Ministry of Energy

Part II

ONTARIO'S ENERGY DEMAND
TO 2000

UPDATE 1983

Ministry of Energy
December 1983

This report is Part II of the Submission by the Ontario Ministry of Energy to the National Energy Board in relation to the Board's Update of Energy Supply and Demand, 1983-2005.

FOREWORD

The Ontario Ministry of Energy produces regular analyses and forecasts of the province's energy requirements. It maintains a set of highly disaggregated models and uses them to prepare long term demand projections for oil, natural gas, coal, electricity and other energy forms. The forecasts incorporate demographic, economic and technology trends as well as energy pricing considerations.

This report deals with the province's energy demand to the year 2000. The study was completed in September 1983.

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I. OVERVIEW OF THE ENERGY DEMAND PROJECTIONS

I.1 INTRODUCTION

This report presents the Ministry's current projections of energy demand in Ontario to the year 2000. It is assumed that existing government energy policies, particularly those affecting conservation and oil substitution, remain unchanged. The report does not address the appropriateness of existing or future policy directions.

The demand outlook for each type of fuel is analyzed in the industrial, commercial, residential and transportation sectors. It is developed from, and therefore conditional upon, assumptions about demographic, economic and technological trends as well as energy prices.

The next section discusses the major macroeconomic and energy pricing assumptions on which the study is based. Additional assumptions relating to energy-using technologies, composition of the capital stock and the efficiency of energy use are discussed in the subsequent chapters which deal with the situation in each sector.

I.2 DEMOGRAPHIC, ECONOMIC AND ENERGY PRICE ASSUMPTIONS

Demographic Trends

Changes in the demographic composition exert a significant influence upon energy demand. The size and age composition of the population affect the aggregate demand for and supply of goods and services, with particularly important implications for housing and commercial services.

Since 1974 federal immigration policy has tightened considerably. As well, net migration from Ontario to other provinces has increased since the mid-70s. These trends have combined with a long term reduction in fertility rates to produce a deceleration in Ontario's population growth.

Population projections for the province indicate that slow growth will continue well into the future and that the proportion of persons in the mature and senior age brackets will increase steadily. The present analysis of energy demand incorporates these fundamental demographic changes.

- Ontario's population is likely to grow at an average annual rate of 0.8 per cent in the 1980-2000 period. This is well below the average 1.3 per cent rate recorded in the 1970s. The population in 2000 could be in the 10 million range, compared with 8.7 million in 1982.

- The proportion in the 20 - 65 age group would probably rise to 62 per cent in 2000 from 59 per cent at present.

- Persons over 65 years of age would comprise some 14 per cent in 2000, compared with the current level of 11 per cent.

Economic Outlook

The future economic environment was assessed using the DRI macroeconomic model of Canada as well as the macroeconomic and input-output models of the University of Toronto Institute for Policy Analysis. The macro-models provided indicators of economic performance at the national level, and, within that framework, the input-output model generated regional results. The outlook for the provincial economy, including the industrial profile, was thus developed in a national context.

The economic scenario underlying the present energy demand study assumes a further relaxation in domestic monetary policy in the near term but a continuation of fiscal tightness for several more years. It also assumes that the international economy will emerge gradually from the recent severe recession, and, as growth proceeds at a moderate pace over the longer term, problems relating to trade protectionism and financial indebtedness will not become more acute than they are at present. Furthermore, the scenario assumes that world energy markets will not be disrupted by major supply or price shocks.

Key results of the economic assessment are summarized below:

- The Ontario economy is currently in an expansionary phase following a sharp contraction in the 1981-82 period.

- The real Gross Provincial Product (GPP) is projected to grow at an average annual rate of 3.2 per cent in the 1983-85 period. Over the entire current decade, however, growth would average about 2.5 per cent. An improvement to the 2.8 per cent range is expected in the 1990s.

- The trend to a service-oriented economy would continue in response to demographic change and upward shifts in the demand for services. In particular, economic activity in service sectors such as finance, insurance, communications, wholesale and retail trade, and personal and business services will expand faster than the overall economy as a result of specialization and relatively high income elasticities in the long run.

- Growth in the goods-producing industrial sectors, many of which have to compete for export markets, will probably not match the GPP expansion.

- The inflation rate has dropped sharply in 1983 from the double-digit levels of the past two years. The outlook is now more optimistic than was the case a year ago.

- The economic recovery together with an improved inflation prospect has strengthened the long-term outlook for job creation and real income growth.

Energy Prices

The Ministry of Energy produces periodic projections of energy prices. A study completed in mid-1983 covers possible future trends in world oil prices, the Canadian blended price and the wholesale price for natural gas. It also includes retail prices of petroleum products, natural gas and electricity in Ontario.

Energy agreements between the federal government and governments of producing provinces, drawn up in 1981 and subsequently modified, form the basis for domestic crude oil and natural gas prices to the end of 1986. Accordingly, Canadian oil prices are limited by the world oil price, adjusted for quality. As well, the wholesale price of natural gas is fixed at 65 per cent of the Toronto refinery acquisition cost of oil, based on heat content.

The June 30, 1983 Amendment to the Canada-Alberta agreement will keep wellhead oil prices fixed until the end of 1984 if world oil prices remain stable. Canadian oil discovered between 1974 and 1981, which previously qualified under the Special Old Oil Price (SOOP) program, and oil produced through infill drilling receive the New Oil

Reference Price (NORP) effective July 1, 1983. Currently, SOOP oil accounts for approximately 11 per cent of domestic oil production. The reclassification of SOOP oil to NORP oil has increased the potential influence of world oil prices on domestic energy prices.

Since 1980, the gap between the average domestic oil price and the world oil price has narrowed considerably as a result of sharp increases in Canadian wellhead prices and a decline in the world price. Currently, the Toronto refinery acquisition cost is just over 90 per cent of the average cost of imported oil landed in Montreal, adjusted for quality.

It is recognized that the world oil market is quite unstable at present and it is likely to remain so for quite some time. There is a large amount of shut-in capacity, mainly within the Organization of Petroleum Exporting Countries (OPEC) and in Mexico. Despite OPEC's relative success in restraining production within its membership, the "cartel" is now weaker than was the case only a few years ago. As long as excess capacity is significant, OPEC, like any other cartel, will have difficulty in maintaining control over price or production within the group. This situation raises the possibility of a decline in real oil prices, especially in the near term.

Another source of market instability, at least in the short run, is fluctuation in demand. The world economy is currently emerging from the recent severe recession, with the United States and Japan leading the other members of the Organization for Economic Co-operation and Development (OECD). Should there be a pause in the recovery, the demand for oil could drop, thus increasing the probability of a decline in real prices in the near term.

A third source of instability - short term as well as long term - is the political environment in some major oil-exporting regions. This factor could lead to oil supply disruptions, and depending on the severity of the problem, there could be sudden and sharp price increases.

While many scenarios for world oil prices are possible, the present energy demand analysis is based on one which assumes that no major disruptions will occur in world oil markets, and that economic growth in Western Europe will soon phase in with the expansion in North America and Japan. Although the rate of international economic growth would probably be moderate by historical standards, a concurrent expansion would lead to increased demand for OPEC oil and a steady reduction in shut-in capacity. The downward pressure on prices which currently exists would ease gradually, and opposite pressures could emerge before the end of this decade. However, actual prices would likely fluctuate rather than ratchet upward steadily over the next few years.

This scenario yields the following prospects for energy prices:

- World oil prices in real terms would decline further in 1984, and, after 2-3 years of relative stability, acquire momentum for escalation at a later stage.

- For purposes of this analysis, it is assumed that demand pressures will be sufficiently strong by the turn of the decade to produce an increase in real prices averaging 5-6 per cent per annum between 1988 and 1993. A moderate advance of about 3 per cent per year is assumed to occur from 1993 to 2000. The resulting trend in the real price of international oil would reach the 1981 peak in 1994.

- However, the precise timing of world oil price increases is quite uncertain. There is a good likelihood that continuing excess production capacity will limit price escalation until the middle of the 1990s.

- Between 1983 and 1985, retail prices for petroleum products and natural gas in Ontario are unlikely to rise faster than the inflation rate. Beyond 1985, and particularly in the 1990s, prices for these fuels could grow in real terms.

- In the medium term, electricity price increases would likely exceed the inflation rate. However, over the full period from 1983 to 2000, the increase in real terms would probably be quite small.

I.3 SUMMARY OF THE ENERGY DEMAND PROJECTIONS

The projections were developed with the aid of the Ministry's energy demand models for the industrial, commercial, residential and transportation sectors. The models require information from economic and energy price projections as well as detailed assumptions regarding the degree of inter-fuel substitution, conversion efficiencies and changes in the stock of energy-using equipment. Each model aggregates, by end use and fuel types, the estimates of secondary energy requirements. These results, together with assumptions about fuels used in the energy supply sector, form the basis for estimating the demand for primary energy.

The macroeconomic and energy price projections were described earlier. The microeconomic and technical assumptions relating to inter-fuel substitution and end-use efficiency in each sector will be dealt with in subsequent chapters.

Energy Demand: 1980-1985

Ontario's secondary energy demand fell by 12 per cent between 1980 and 1982. The decline was particularly large in the industrial sector (19 per cent), transportation (12 per cent), and the residential sector (7 per cent). Energy use in commercial services such as trade, finance, insurance and business services was virtually unchanged.

This pattern of decline indicates a strong link with the uneveness of the recession across the economy. Industrial output in manufacturing, especially in large energy-using industries such as iron and steel, mining and smelting, and pulp and paper contracted far more sharply than the overall economy. While the real gross provincial product fell by about 5 per cent in 1982, real output in major energy-using industries declined by 12-20 per cent. Freight transportation also contracted much more than the total economy. However, the non-transportation service sectors were only marginally affected in terms of real output.

The 1980-82 reduction in energy demand was due not only to the nature and severity of the recession but also to domestic energy price increases and government conservation programs. Crude oil and natural gas prices rose by 130 per cent and 87 per cent respectively from 1979 to 1982. These increases helped to restrain energy demand in at least two important ways. They had direct impacts on the use of these fuels. They also contributed to the recession and inflation, and led to a pervasive reduction in energy use as a result of the decline in real income and production.

Retail energy prices have risen enormously in real terms over the past decade. Between 1973 and 1982, the general level of consumer prices advanced by 130 per cent. However, price increases amounted to about 250 per cent for gasoline, more than 400 per cent for home heating oil, between 330 and 550 per cent for natural gas in various sectors, and just under 180 per cent for electricity. A major part of these shifts in relative fuel prices has only recently occurred.

The demands for energy fuels and forms in the 1980-82 period have responded in varying degrees to the combination of recession, relative price changes, conservation and off-oil policy measures. Consumption of oil fell by 19 per cent, coal 15 per cent, natural gas 10 per cent and electricity less than 2 per cent. A major factor was the variation in recessionary impacts within sectors. Many industries, for example, non-metallic minerals and industrial chemicals, whose production declined substantially, are heavy users of oil, natural gas and coal. Also, the off-oil policy and relative price changes have been producing notable differential impacts on fuels used in the residential sector. As well, relative price changes have led to fuel substitution in industrial enterprises which are equipped with dual-firing capability. However, it is unclear that substitution effects in other sectors have been significant in the 1980-82 period. The investment required to reflect fuel choice appropriate to the new structure of relative prices has no doubt been limited by high interest rates.

Table 1.1 Secondary Energy Demand By Sector, 1980-85

(Petajoules)

	1980	1981	1982	1983	1984	1985
Industrial	899	827	732	779	813	835
Commercial	285	284	280	283*	287	290
Residential	485	456	453	465*	470	474
Transportation	626	604	554	570	565	557
Total Secondary	2295	2171	2019	2097	2135	2156

* Adjusted for the effect of the unusually mild winter on space heating requirements.

Sources: Statistics Canada and Ontario Ministry of Energy.

Table 1.2 Secondary Energy Use By Fuel, 1980-85

(Petajoules)

	1980	1981	1982	1983	1984	1985
Oil	973	895	788	810*	800	783
Natural Gas	705	672	637	667*	690	706
Electricity	351	357	346	358*	368	377
Coal	209	187	177	188	200	207
Other**	57	60	71	74	77	83
Total	2295	2171	2019	2097	2135	2156

* Adjusted for the effect of the unusually mild winter on space heating requirements.

** Includes wood, wood waste, spent pulping liquor, propane, solar and other renewables.

Sources: Statistics Canada and Ontario Ministry of Energy.

With the resumption of economic growth in 1983, energy demand, adjusted for weather, is expected to rise once again, mainly in the industrial sector. However, past price increases and conservation programs will continue to restrain energy use throughout the economy. Furthermore, the economic recovery itself is expected to be moderate by historical standards.

- The level of total energy demand in 1985 is likely to be as much as 6 per cent below the 1980 level.

- In particular, most of the reduction in oil demand over the past few years will probably be permanent. By 1985, oil consumption might be some 20 per cent below the 1980 level. It would take an enormous amount of economic growth or a massive reduction in the real price of oil products to restore demand in the near term.

Energy Demand: 1985-2000

Beyond 1985, Ontario's secondary energy demand will increase but at rates substantially below those recorded in the 1970s. Energy price effects, improvements in the efficiency of energy use, and the pace and character of economic growth all contribute to this expected long term trend.

The process of adjustment to past energy price increases is long and complex. It involves changes in the behaviour of energy users, conversion of equipment to use relatively cheaper energy forms, adoption of existing energy-saving technology and development of new and more efficient technologies. Normally the least expensive responses can be expected to occur before those which are more costly. Furthermore, those adjustments which require large investments, for example, turnover and improvements in the stock of energy-using equipment and structures, tend to be delayed by weakness in the economy and high interest rates. Consequently, the own-price and cross-price elasticities of fuel demands are likely to be smaller in the short run than in the long term. Furthermore, the incremental impact can be expected to diminish as the stock of older, inefficient capital goods becomes progressively smaller.

Data from the Canadian Industry Program for Energy Conservation indicate a marked improvement (about 15 per cent) in the efficiency of energy use in industries since the mid-70s. While further gains are likely in the years ahead, the rate of improvement is assumed to diminish beyond the mid-80s.

Efficiency gains have also been secured in the residential, commercial and transportation sectors. Based on the available data, it appears that improvements to date have not been as large as those in goods-producing industries. The projections of energy demand in the non-industrial sectors incorporate a continuation of efficiency gains well into the next decade.

In broad terms, the results in the post-1985 period reflect an extended period of adjustment to energy price increases, mainly those which have already occurred, and continuing improvements in the efficiency of use throughout the economy.

Also, the projections include long-term, fuel-substitution effects. The competitiveness of electricity has improved substantially as a result of earlier price changes. While it will probably be undermined somewhat in the medium term, it is expected that the position in the 1990s will be more favourable than that which currently exists. In addition, the continuation of off-oil policies will benefit electricity as well as natural gas and renewable energy forms.

The rate of economic expansion and structural change will exert a major influence on the long-term energy demand outlook. As pointed out earlier, the Ontario economy is expected to obtain relatively stronger growth impetus from the service sectors than from the industrial goods-producing sectors. Service industries are generally less energy-intensive than those in the industrial sector. Consequently, in the long run, economic growth in Ontario will likely be secured with relatively small increases in total energy use.

The most significant features of the projections for secondary energy demand in the province are set out below:

- Over the full 1980-2000 period, growth in total energy demand would likely average less than one per cent per year, based on real GPP growth of 2.7 per cent.

- Following the recession and economic recovery in the 1980 to 1985 period, energy demand is projected to grow at a 1.4 per cent average annual rate. This is about one-half the growth rate for the economy. It contrasts sharply with the experience of the 1970s when energy use grew at about three-quarters of the rate for the economy.

Table 1.3 - Summary of Assumptions and Results

(% per annum)

	1970/80	1980/90	1990/2000	1980/2000
Population	1.3	1.0	0.7	0.8
Real GPP	3.3	2.5	2.8	2.7
Total secondary energy	2.5	0.2	1.3	0.8
Total primary energy	3.1	0.5	1.6	1.0

Sources: Statistics Canada and Ontario Ministry of Energy.

- The oil share of secondary energy is expected to fall significantly because of its price disadvantage and government off-oil policies.

- Natural gas, a major competitor for oil markets, is likely to improve its position in this decade. However, its share may stabilize between 1990 and 2000 because of competition from coal in the industrial sector and from electricity in the residential sector.

- The electricity share of secondary energy is projected to rise steadily, reaching 18 per cent by 1990 and 20 per cent by 2000. This trend reflects continuing adjustments to the improved long run competitiveness of electricity.

Table 1.4 - Shares of Secondary Energy Requirements by Fuel

(% of Total)

	1975	1980	1985	1990	1995	2000
Oil	46	42	36	32	30	28
Natural Gas	30	31	33	35	34	34
Coal	10	9	10	11	11	12
Electricity	14	15	17	18	19	20
Other*	0	3	4	4	6	6

* Includes wood, wastes and solar.

Sources: Statistics Canada and Ontario Ministry of Energy.

- Coal will retain an important part of the total energy market, mainly because of industrial uses.

- Other energy forms include wood waste and spent pulping liquor used in the pulp and paper industry, wood used for home heating, energy from wastes and solar energy. These renewable and recoverable energy forms have a relatively small market at present. However, future expansion in demand will likely occur as a result of emerging technologies for converting wood and wastes to energy and for solar heating.

Total primary energy demand includes secondary energy and energy used in the energy supply industry. It is projected to rise at an annual average rate of approximately 1.0 per cent between 1980 and 2000. This reflects the basic trends in secondary energy use as well as shifts to nuclear generation of electric power.

In summary, the scenario on which the projections are based implies that the demands for energy fuels will grow very slowly in future years. Furthermore, oil will be replaced to a significant degree by electricity and natural gas in non-transportation uses of energy.

Table 1.5 - Energy Growth Rates

(% per annum)

	1970/80	1980/90	1990/2000	1980/2000
Electricity(Secondary)	4.4	1.8	2.4	2.1
Coal (Primary)	0.0	-1.9	2.8	0.4
Oil (Primary)	2.0	-2.3	0.4	-0.9
Natural Gas (Primary)	4.7	1.4	1.1	1.2
Total primary energy	3.1	0.5	1.6	1.0

Sources: Statistics Canada and Ontario Ministry of Energy.

Table 1.6 - Shares of Primary Energy Requirements by Fuel

(% of Total)

	1975	1980	1985	1990	1995	2000
Oil	42	38	32	29	27	26
Natural Gas	25	22	23	24	23	23
Coal	15	14	13	11	12	13
Nuclear	4	12	16	21	22	23
Hydraulic	14	12	13	12	12	11
Other*	0	2	3	3	4	4

* Includes wood, wastes and solar.

Sources: Statistics Canada and Ontario Ministry of Energy.

II. INDUSTRIAL SECTOR

II.1 THE DEMAND MODEL

Industrial energy demand covers energy use in mining, agriculture, forestry, construction and manufacturing. The manufacturing sector is modeled in detail for twelve sub-sectors. Currently, about two-thirds of total use in industry is for process heat and the remainder for motive power, feedstock and auxiliary purposes.

The three leading energy-using industries in Ontario are pulp and paper, iron and steel and industrial chemicals. These three accounted for over half of the industrial sector's total energy requirements in 1982. This calculation includes coal used by the iron and steel industry to produce coke and manufactured gases, and natural gas used as a chemical feedstock.

The projections of energy demand are based on an end-use demand model which incorporates assumptions about growth in industrial output and changes in industrial processes, fuel mix and energy efficiency for new and existing capacity.

Sectoral economic growth projections and assumptions about energy use are presented in section II.4.

II.2 SHORT TERM RESULTS: 1980-1985

In 1980, the industrial sector in Ontario consumed 899 petajoules (PJ) or 39 per cent of secondary energy. By 1982, consumption had fallen to 732 PJ and is expected to recover to 835 PJ by 1985.

Industrial energy consumption in the 1980-85 period reflects the effects of the 1981-82 recession, relative price changes, and conservation and oil substitution investments made since the mid-70s.

Energy use in 1982 was 19 per cent below the 1980 level. This was due in large part to the contraction in industrial output. Some of the largest energy-using industries had major reductions in shipments. Iron and steel production was down 20 per cent from 1981 levels, while mining and non-metallic minerals output fell even further.

The 1980-82 reductions in demand for oil (37 per cent), natural gas (22 per cent) and coal (15 per cent) were substantially greater than for electricity (8 per cent). This was due in part to the impact of the recession on industries such as non-metallic minerals and industrial chemicals that rely heavily on the use of fossil fuels. It was also due to relatively sharper price escalation for oil and natural gas over the past decade, especially since 1980, and government off-oil policies. Furthermore, the pulp and paper industry has increased its reliance on renewable energy sources. In 1980, wood waste and spent pulping liquor accounted for 47 PJ or 38 per cent of energy used by this industry in Ontario. By 1982, the amount derived from these sources had risen to 59 PJ or 45 per cent of the industry's requirement.

The initial energy conservation goals of the Canadian Industry Program for Energy Conservation (CIPEC), typically 10-15 per cent savings per unit output compared to base year use by 1980, were generally achieved. The base year for each sector depends on the year in which a sectoral CIPEC Task Force was formed and on data availability. Most of the large energy-using industries have 1972-75 base years. Overall industrial sector savings amounted to 15.4 per cent by 1980 versus a weighted goal of 12 per cent.

Further progress was achieved in 1981 resulting in a weighted cumulative saving of 16.3 per cent. However, reduced capacity utilization and investment during the recession reduced the efficiency factor in 1982. The overall weighted savings declined to the 1980 level of 15.4 per cent.

The iron and steel industry's 1980 target was a 3.3 per cent cut in energy use per unit of output. An actual 4.7 per cent reduction was achieved. However, the 1982 recession reversed more than one-half of these efficiency gains.

The task force goal was to achieve a 17.0 per cent fuel efficiency improvement by 1980 in the industrial chemicals sector. A 22 per cent gain was in fact achieved by 1982.

In 1982, the pulp and paper industry was third in energy consumption among industries in Ontario, behind iron and steel and industrial chemicals.

This industry's conservation task force set a goal of reducing 1980 energy consumption per unit of output by 12.0 per cent compared to 1972 levels. The industry has surpassed this target and has now adopted a 1985 goal of 30 per cent reduction relative to 1972. Progress by 1982 was 17.0 per cent.

With the resumption of industrial growth, energy demand is expected to increase from 1982 to 1985. The increase for natural gas could amount to 15 per cent, oil 19 per cent, coal 17 per cent and electricity 10 per cent. This pattern essentially reflects the general restoration of growth in production and the specific recovery of those industries which use large amounts of fossil fuels.

However, energy demand is unlikely to return to 1980 levels in the near term. There are several reasons for this. First, while general manufacturing activity will have recovered, excess capacity will persist in some energy intensive industries such as mining and non-metallic minerals. Second, as capacity utilization rates improve in most industries, the efficiency of energy use will also rise. Third, lower interest rates and the restoration of cash flow will enable companies to undertake some of the conservation investments which were postponed during the recession. Finally, there will be the continuing impact of earlier energy price increases. As a result, oil and natural gas use will be some 25 per cent and 11 per cent below their respective 1980 levels.

Table 2.1 - Industrial Sector Energy Use, 1980-85

(Petajoules)

	1980	1981	1982	1983	1984	1985
Oil	153	137	96	109	113	114
Gas	355	317	276	295	308	317
Electricity	135	136	124	127	132	137
Coal	209	187	177	188	200	207
Other*	47	50	59	60	60	60
Total	899	827	732	779	813	835

* Includes wood wastes and spent pulping liquor.

Note: Industrial demand includes energy use in mining, manufacturing, agriculture, forestry and construction. Actual data for 1980-82 and projections for 1983-85.

Sources: Statistics Canada and Ontario Ministry of Energy.

II.3 LONG TERM PROJECTIONS: 1985-2000

In 1985, the industrial sector is expected to use 835 PJ or 39 per cent of Ontario's total secondary energy demand. In 2000, energy requirements for the sector are projected to be 1235 PJ, or 46 per cent of the total. Over the 1980-2000 period, total industrial energy demand could grow at a 1.6 per cent average annual rate. For the 1985-2000 period, industrial energy demand is expected to grow at 2.6 per cent per annum.

The attainment of CIPEC targets will help keep industrial energy demand growth at a rate which is below that of industrial output in the near term. Beyond 1985, there will be a continuing response to earlier energy price escalation. Major equipment such as furnace and boiler systems with an economic life of 10-20 years, will have to be replaced in this time period. New, efficient, 'state of the art' systems will be introduced as replacement of existing systems is required, as changes in production processes occur, and as new production capacity is needed.

These technological efficiency gains will help to restrain the growth in energy demand relative to the expected 3 per cent growth in industrial output in the 1985-2000 period.

Perhaps the most significant feature of the industrial energy demand outlook is the trend away from oil, mainly toward electricity. The competitiveness of electricity has improved substantially as a result of large relative increases in oil and gas prices over the past decade. Recent trends in fuel shares in some energy intensive industries are already reflecting relative price effects. For example, oil is being replaced by natural gas in the lime industry, and by electricity and natural gas in pulp and paper, and mining and smelting. Also, electricity has been gaining from both natural gas and oil in iron and steel production. In view of the long lead times for investment, the shift to electricity could continue for several more years.

Natural gas has been benefiting from the off-oil shift. Existing federal government policy supports the installation of natural gas firing capability, thus making it possible for natural gas to expand into the industrial fuel oil market. However, past price increases for natural gas have exposed this fuel to competition from wood waste in the pulp and paper industry and from electricity and coal in other industries. In the years ahead, a significant reduction in the relative price of natural gas might be required if this fuel is to have a growing market share.

A major shift to coal from oil and natural gas has already occurred in the cement industry. However, future coal requirements will grow primarily in response to coking needs in iron and steel production, where it is used as both an energy source and a raw material. In the second half of the 1990s some of this coke could be replaced by electricity if the plasma arc process is adopted.

Electricity could, over the 1980-2000 period, record an average growth of 2.2 per cent per year. For the post-1985 period, average annual growth could be in the range of 2.9 per cent. This is somewhat higher than the projected growth rate for natural gas.

Renewable energy use, primarily in the pulp and paper industry, will continue to expand, thereby reducing the growth in demand for conventional energy.

Table 2.2 - Industrial Sector Energy Demand Growth Rates

(% per annum)

	1970/80	1980/90	1990/2000	1980/2000
Oil	-1.0	-1.6	1.1	-0.3
Natural Gas	4.3	1.4	1.8	1.6
Coal	-0.3	1.8	2.2	2.0
Electricity	2.8	1.4	3.1	2.2
Other*	-	3.5	2.1	2.8
Total	2.2	1.2	2.0	1.6

* Includes wood waste, spent pulping liquor, solar and other renewables.

Sources: Statistics Canada and Ontario Ministry of Energy.

Table 2.3 - Industrial Sector Fuel Shares

(% of Total)

	1975	1980	1985	1990	1995	2000
Oil	22	17	14	13	12	12
Natural Gas	40	40	38	40	40	40
Coal	24	23	25	25	25	25
Electricity	14	15	16	15	16	17
Other *	N/A	5	7	7	7	6

* Includes wood waste, spent pulping liquor, solar and other renewables.

Sources: Statistics Canada and Ontario Ministry of Energy.

II.4 KEY ASSUMPTIONS

For the purpose of estimating future growth in energy demand in the industrial sector, the macroeconomic projections were combined with specific assumptions about energy conservation and fuel substitution. The main assumptions for the industrial sector as a whole are set out below, along with assumptions about major sub-sectors.

Economic Growth: Real domestic product for manufacturing is projected to increase at a rate of 1.8 per cent in the current decade and 2.8 per cent in the 1990s. For 1982-2000, growth is projected to be 3.1 per cent per annum.

Conservation: Conservation measures will be adopted where the return on investment and payback period are attractive compared to alternative investments. Recent industry experience has shown that conservation investments have often had higher than expected paybacks and have been essentially risk-free. However, in view of the current projections for energy prices, the return on conservation investment may be revised downward.

The weighted efficiency target set by CIPEC is a further 7.6 per cent energy saving. This would amount to an overall reduction in energy use per unit output of 23 per cent in 1985 compared to base year levels.

Between 1985 and 2000 additional savings of 5-10 per cent are assumed for fossil fuel use. New industrial plants are assumed to have fossil fuel requirements that are 15-25 per cent below those of existing plants of equivalent size.

Cogeneration: Cogeneration is currently significant in Ontario in the pulp and paper industry and to a lesser extent in the primary metals and chemicals industries. The economic potential for additional industrial cogeneration in Ontario before the year 2000 is projected to be in the 500-1000 MW range, about 2-4 per cent of Ontario Hydro's existing capacity. Currently, 600 MW of industrial self-generation capacity exist in Ontario.

The electricity produced and used by industry is counted as industrial sector demand while the primary fuels used to generate the electricity are counted in the energy supply sector.

Fuel Choice: The assumptions made about fuel choice in each industry are based on estimates of the stock of energy-using equipment and projections of relative fuel prices. These are outlined below for large energy-using industries.

Pulp and Paper: For newsprint, fine paper and other products, the forecast average growth rate is 2.1 per cent for the 1980s and 3.4 per cent for the 1990s.

The main assumption made with regard to process choice is that thermo-mechanical pulping (TMP) will continue to replace chemical pulping because of its higher yield and reduced environmental pollution. The TMP process consumes more electricity but less fossil fuel than chemical processes.

Iron and Steel: Output in this industry is projected to grow at an average annual rate of 1.9 per cent during the 1980s and 2.2 per cent in the 1990s.

The industry's conservation Task Force has set a 1985 target of a 7 per cent efficiency gain relative to 1972. It is assumed that this will be achieved.

Open hearth furnaces, accounting for 23 per cent of capacity in 1976, will likely be replaced before 2000. New replacement capacity is expected to be 90 per cent basic oxygen furnaces and 10 per cent electric. Basic oxygen furnaces use significantly less energy than open hearth furnaces.

Coke oven and blast furnace gas used for the generation of electricity is assumed to grow at the same rate as coking coal. In the mid - 1990s some electricity substitution in the form of plasma arc technology may be introduced to reduce coking coal consumption.

Industrial Chemicals: The industrial chemicals industry uses natural gas and oil as both a fuel source and a feedstock. The Ministry's industrial energy demand model counts natural gas used as feedstock in the industrial sector. However, oil used as a feedstock is counted in the petrochemical sub-sector of the energy supply sector.

Ontario ethylene production has fallen significantly since 1980. Some growth from this low level is expected after 1982. Chlorine output will likely be constant until 1986, after which it could grow at a rate of 2.4 per cent annually. Ammonia output is expected to increase by 50 per cent in 1985. No increase is projected thereafter.

It is assumed that all new chlorine capacity will use energy-efficient membrane cells instead of diaphragm cells, and that between 1985 and 1995 all existing capacity will switch to membrane cells.

Based on energy efficiency gains to date, the CIPEC sectoral target of 31 per cent to 1985 is assumed to be achieved. However, incremental improvements in energy use are likely to be limited by rising costs.

III. COMMERCIAL SECTOR

III.1 THE DEMAND MODEL

Commercial sector energy demand covers energy use in institutional buildings (for example, schools, universities and colleges, hospitals and nursing homes) as well as in commercial buildings (for example, offices, retail stores, hotels, theatres and warehouses). Municipal waterworks and street lighting are also part of this sector. Currently, about 65 per cent of the sector's total energy use is for space heating and cooling, and the rest is for water heating, lighting and auxiliary purposes.

An end-use demand model is used to project energy requirements. It incorporates assumptions regarding the stock of different buildings, energy efficiency factors for each end-use in existing and in new buildings, and future fuel shares for space heating and water-heating loads. Key assumptions are outlined in section III.4.

III.2 SHORT TERM RESULTS: 1980 - 1985

Energy demand in the commercial sector amounted to 285 PJ or 13 per cent of total secondary energy in 1980. It is expected to change only marginally by 1985.

Total energy use fell slightly in 1982. Energy management programs, introduced in government buildings since 1980, have contributed to this result. Also, milder than normal weather reduced space-conditioning needs in the entire sector. Large oil and natural gas price increases were an additional factor. However, the direct effect was perhaps limited because institutional arrangements which generally include energy costs in rents tend to interfere with the transmission of price signals to tenants.

During the recession, real output in the services sector declined, but only by about 0.5 per cent. The recession very likely led to underutilization of floor space in the private sector. However, the main applications (heating and cooling) are relatively insensitive to occupancy rates in many types of building structures.

As the economic recovery proceeds, increases in service sector output will initially come from more intensive utilization of existing buildings. Therefore, it is unlikely that energy demand growth would match the 2.3 per cent average growth in output over the 1980-85 period. In 1985, this efficiency gain together with conservation measures will reduce energy use per square metre in existing buildings by 6.5 per cent from the 1980 levels.

Table 3.1 - Commercial Sector Energy Use, 1980-85

(Petajoules)

	1980	1981	1982	1983**	1984	1985
Oil	47	43	40	40	38	36
Natural Gas	141	141	140	141	145	148
Electricity	97	100	100	102	104	106
Total*	285	284	280	283	287	290

* Includes solar energy use which amounts to 0.1 PJ in 1982, rising to 0.2 PJ in 1985.

** Because of the unusually mild winter, actual results could be as much as 7 per cent below those shown.

Note: Actual data for 1980, and projections for 1981-1985. The estimates for 1981 and 1982 differ from Statistics Canada data due to a reclassification of one major enterprise from industrial to commercial.

Sources: Statistics Canada and Ontario Ministry of Energy.

Although the total amount of energy used is likely to grow modestly in the near term, changes in fuel shares will be significant.

Oil consumption has already declined by 15 per cent between 1980 and 1982. A further 10 per cent reduction is projected in the next three years. Natural gas and electricity will remain the prime substitutes for oil.

In 1980, oil met 16 per cent of commercial sector energy demand. Natural gas provided about 49 per cent and electricity 35 per cent. By 1985, the market share for oil would decline to 12 per cent while natural gas and electricity shares would increase slightly.

III.3 LONG TERM PROJECTIONS: 1985-2000

By the year 2000, energy use in the commercial sector is projected to be about 347 PJ, or 13 per cent of the provincial total. The increase from the 1985 level of 290 PJ represents an annual growth rate of approximately 1.2 per cent.

Service sector activity is expected to grow at a faster pace than the overall economy, with real output expanding at a 3.6 per cent average rate. This reflects an increasing demand for services such as communications, business and finance, hotel accommodation, restaurant meals, recreation, care for senior citizens and warehousing. Much of this growth is likely to arise from technology-based productivity gains. Therefore, output growth may occur without equivalent changes in floor space. Total floor space is expected to grow by 2.1 per cent per year.

Additional floor space will form the basis for an increase in energy demand. However, given the large rise in energy costs to date, new buildings are likely to be much more efficiently designed in the years ahead. Also, ageing of the existing stock will create a continuing need for renovations. Since retrofit is more economical when undertaken as part of the renewal process, the average efficiency of energy use is likely to increase in the long run. Consequently, energy demand is expected to grow more slowly than floor space. Furthermore, the energy requirement for space heating will likely decline in relation to total energy use (from 58 per cent in 1980 to about 52 per cent by the turn of the century).

Due to relative fuel costs, a persistent movement from oil-based heating systems is anticipated, primarily to natural gas in the current decade and electricity in the 1990s. These trends will be evident in both existing and new buildings. There may also be some increase in the use of energy from waste and wider application of solar heating technology as cost-effectiveness improves.

Electricity is required not only for heating, but also for cooling, lighting and auxiliary purposes. These uses, which amounted to 38 per cent of total energy use in 1980, could grow to some 44 per cent by the year 2000. All uses considered, a notable improvement in the market position for electricity is expected over the long term.

Table 3.2 - Commercial Sector Fuel Demand Growth Rates

(% per annum)

	1970/80*	1980/90	1990/2000	1980/2000
Oil	-9.3	-5.6	-4.2	-4.9
Natural Gas	8.2	1.0	1.1	1.1
Electricity	7.8	1.7	2.8	2.3
Solar & Wastes	0.0	31.1	20.9	25.8
Total	2.3	0.4	1.5	1.0

* Growth rates shown are for the 1970-1977 period which is more representative of the 1970/80 period owing to the break in the series caused by Statistics Canada's revisions in 1978.

Sources: Statistics Canada and Ontario Ministry of Energy.

Table 3.3 - Commercial Sector Fuel Shares

(% of Total)

	1975*	1980	1985	1990	1995	2000
Oil	16.2	16.3	12.4	8.8	6.4	4.9
Natural Gas	50.5	49.1	51.0	52.1	51.7	50.1
Electricity	33.3	34.6	36.5	39.0	41.6	44.4
Solar & Wastes	0.0	0.0	0.1	0.1	0.3	0.6

* Prior to 1978, apartment buildings were included in the commercial sector (rather than residential). Consequently, the 1975 figures overstate the fuel shares for natural gas and electricity while understating the oil share.

Sources: Statistics Canada and Ontario Ministry of Energy.

III.4 KEY ASSUMPTIONS

The macroeconomic and energy pricing forecasts are used to estimate the future amount and composition of commercial sector floor space. These forecasts also influence assumptions about other determinants of energy use such as fuel choice and efficiency.

Building Stock

Total building stock is projected to grow by some 44 per cent in the 1982-2000 period, with the greatest growth in offices, hotels and restaurants and the least in institutional buildings. Specific assumptions are outlined below.

Institutional Buildings: Over the forecast period, health care floor space is likely to expand in response to the needs of the ageing population. However, there may not be any net increase in school floor space.

Offices: Office floor space demand depends upon service sector output levels. However, increased productivity is assumed to restrain the demand for additional floor space in relation to output.

Hotels and Restaurants: The return to positive economic growth is assumed to reduce the current surplus of hotel accommodation over the short-term. Additions to hotel floor space are anticipated as business travel and leisure activity increase with general economic and disposable income growth. In addition, increased disposable income will spur the demand for out-of-home meals and restaurant facilities. Furthermore, these trends will likely become more pronounced with the maturing of the population.

Stores and Warehouses: Floor space expansion in retail trade will arise from the increasing demand for consumer goods. Higher levels of retail and wholesale trade will in turn require more warehousing facilities. However, since manufacturers and merchandise traders are becoming more cognizant of inventory holding costs, it is assumed that warehouse additions will not match increases in long-term retail trade.

Fuel Choice

Oil use in existing buildings is assumed to decline considerably by the year 2000 due to its relative price disadvantage compared to natural gas and electricity. During the 1980s, natural gas is assumed to be the main substitute.

Electricity is assumed to increase its share of the space and water heating market throughout the forecast period. Similar trends are assumed for new buildings, but with provisions for increased solar energy penetration in the 1990s.

Efficiency

Since the late 1970s, some types of commercial buildings such as schools, universities and government buildings, have achieved reductions of up to 25 per cent in energy used per unit of floor space. This decline is primarily attributed to the implementation of energy management programs.

For the rest of the decade, additional savings may be more costly to obtain. The projections assume further savings of 9 per cent for educational buildings and 12 per cent for office buildings by 1990.

New offices and stores, constructed in the mid-1980s and beyond, are assumed to use one-third less energy than the average for existing buildings. New hospitals and warehouses are assumed to use one-quarter less energy than do existing facilities.

IV. RESIDENTIAL SECTOR

IV.1 THE DEMAND MODEL

Residential sector energy demand relates to energy used for household purposes. Currently, about 73 per cent is required for space heating and cooling, and the balance for water heating and appliance use.

Estimates of future requirements are obtained from an end-use demand model by projecting the stock of energy-using equipment and applying unit consumption figures for each major device. The main assumptions on equipment, conversion efficiencies and fuel choice for different types of housing units are outlined in section IV.4.

IV.2 SHORT TERM RESULTS: 1980-1985

In 1980, the residential sector used 485 PJ, about 21 per cent of Ontario's end-use energy. Of this, oil accounted for 31 per cent, natural gas 43 per cent, electricity 24 per cent and other energy forms such as wood about 2 per cent.

Between 1980 and 1982, there was a 7 per cent drop in residential energy use. This decline was due to a combination of circumstances. Among these were the sharp increases in prices of residential heating fuels, government programs designed to reinforce the conservation ethic, more efficient heating systems and relatively mild weather. Furthermore, some consumers probably economized in their use of energy because of severe inflation and unemployment.

In the near term, energy demand in the residential sector is expected to rise slightly. The housing stock continues to expand and the number of new units is increasing as the economy recovers. Also, it is assumed that normal weather will prevail. (The unusually mild winter has significantly depressed 1983 energy requirements for space heating.) However, the continuing impact of earlier price increases and conservation will keep demand levels below the 1980 peak.

Since 1980, there has been a significant shift away from oil towards natural gas, electricity, wood and propane. This shift has resulted from the increased price competitiveness of natural gas and electricity and from government policies and programs. Between late 1980 and early 1983, there were close to 160,000 conversions under the federal government's Canadian Oil Substitution Program alone. Of these, 95,000 were conversions to natural gas, 35,000 to electricity and 30,000 to wood and propane. The trend away from oil is expected to continue well beyond 1985.

Table 4.1 - Residential Sector Energy Use, 1980-85

(Petajoules)

	1980	1981	1982	1983**	1984	1985
Oil	148	112	100	95	90	86
Natural Gas	209	214	221	231	237	242
Electricity	118	120	121	128	131	133
Other*	10	10	11	11	12	13
Total	485	456	453	465	470	474

* Primarily wood.

** Because of the unusually mild winter, actual results could be as much as 10 per cent below those shown.

Sources: Statistics Canada and Ontario Ministry of Energy.
Actual data for 1980-82 and projections for 1983-85.

IV.3 LONG TERM PROJECTIONS: 1985-2000

By 2000, residential energy demand is forecast to be 453 PJ, or 17 per cent of the province's total requirements. Virtually, no growth is expected from the current level.

This relative stability in the long term is attributable to several factors. The number of new housing units coming on stream will reflect the diminishing rate of population growth. Also, the trend to multiple units will continue. These factors will lead to small increases in energy use. However, they are likely to be offset by efficiency gains from improved building design, upgrading of the existing housing stock, and improvements in the efficiencies of space-heating and water-heating equipment and other appliances.

Oil consumption will continue to decline because of price disadvantages and off-oil policy measures. These factors will stimulate the demand for electricity. In addition, electricity will continue to dominate in the expanding use of appliances. Moreover, it will retain its market for space-cooling - a market which will grow as real incomes rise. Consequently, electricity use is expected to increase throughout the forecast period.

The natural gas market will expand well into the 1990s mainly as a result of off-oil measures and improved price competitiveness with respect to oil. However, the penetration rate for natural gas will probably diminish as a result of competition from electricity. Furthermore, efficiency gains in space-heating and water-heating systems will reduce the amount of natural gas used per housing unit.

These trends imply that the market shares for natural gas and electricity will grow substantially as oil is replaced in residential applications. Other fuels such as wood and propane will continue to play an important role in specific parts of the province.

Table 4.2 - Residential Sector Fuel Demand Growth Rates

(% per annum)

	1970/80	1980/90	1990/2000	1980/2000
Oil	-1.8	-11.7	-7.9	-9.6
Natural Gas	5.5	2.1	-0.4	0.9
Electricity	6.5	2.1	1.4	1.7
Other*	3.1	3.4	1.3	2.4
Total	2.7	-0.4	-0.3	-0.3

* Includes wood and solar.

Sources: Statistics Canada and Ontario Ministry of Energy.

Table 4.3 - Residential Sector Fuel Shares

(% of Total)

	1970*	1975*	1980	1985	1990	1995	2000
Oil	48	40	31	18	11	8	5
Natural Gas	33	37	43	51	55	55	55
Electricity	17	21	24	28	31	34	37
Other**	2	2	2	3	3	3	3

* Prior to 1978, apartment buildings were included in the commercial sector by Statistics Canada. Consequently, the 1970 and 1975 figures overstate the fuel share of oil, and understate the shares of natural gas and electricity.

** Includes wood and solar.

Sources: Statistics Canada and Ontario Ministry of Energy.

IV.4 KEY ASSUMPTIONS

Residential energy consumption is related to the stock of housing and the efficiency of energy use in various applications. The main assumptions underlying the projections are outlined below.

Housing Stock

The rate of growth in the housing stock has declined sharply since the late 1970s and it is likely to track the long term demographic trend. Between 1982 and 2000, about one million new housing units might be constructed. Allowing for demolitions, the total housing stock could reach 3.9 million units by the year 2000.

Table 4.4 - Different House Types -
(% of Total Housing Stock)

	1980	1990	2000
Single Detached	57	55	53
Semi/Duplex	10	10	10
Row	5	6	7
Apartments	28	29	30

Sources: Statistics Canada and Ontario Ministry of Energy.

An increasing proportion of new units will be row housing and apartments. The relatively lower cost of multiple units and the increasing average age of the population will support the demand for low maintenance housing.

Space Heating

In 1980, 73 per cent of the energy used in the residential sector was for space heating. This percentage is projected to decline to 67 per cent by 1990 and to 63 per cent by 2000.

Table 4.5 - Residential Sector Energy Demand by End Use

(% of Total)

	1980	1990	2000
Space Heating	73	67	63
Water Heating	14	17	18
Appliances and Space Cooling	13	16	19

Source: Ontario Ministry of Energy. The 1980 estimates are based on an Ontario Hydro survey.

It is assumed that space-heating efficiency will improve significantly for the following reasons:

- Conservation measures in existing housing units. Thermal upgrading of the existing housing stock (improved insulation, storm windows, caulking, night setback, etc.) are assumed to account for a 20 per cent reduction in per unit heating requirements by 2000.

- Improved design and building practices. These are assumed to result in a 33 per cent decrease in per unit heating requirements for new construction by 2000.

- Increasing furnace efficiencies. By 2000, the average efficiency of oil furnaces is assumed to increase by 6 percentage points through retrofitting and installation of new, high-efficiency furnaces. For natural gas, the corresponding assumption is a 20 percentage point gain. This, in turn, assumes market acceptance of high-efficiency condensing and pulse furnaces and boilers.

- Heat pumps are assumed to be present in about 4.4 per cent of homes by the year 2000. Their high seasonal performance factor accounts for a possible reduction of 4 PJ in total residential energy demand by that year. Electric resistance heating is assumed to have an end-use efficiency of 100 per cent throughout the forecast period.

- An increased percentage of housing units using electricity for space heating. The higher end-use efficiency of electricity results in decreased demand for secondary energy.

The assumed distribution of housing units using fuel oil, natural gas or electricity for space heating is shown in Table 4.6.

Table 4.6 - Residential Space Heating -
Fuel Market Shares
(% of Housing Units)

	1980	1990	2000
Fuel Oil	35	12	6
Natural Gas	48	61	63
Electricity	15	23	27
Other*	2	4	4

* Includes wood and solar.

Source: Ontario Ministry of Energy. The 1980 estimates are based on an Ontario Hydro survey.

Water Heating

In 1980, water heating accounted for approximately 14 per cent of the energy used in the residential sector. Water heating requirements are projected to increase steadily because of growth in the population and the housing stock despite improvements in equipment efficiency. The conversion efficiency is assumed to increase by 10 per cent for gas water heaters and 5 per cent for electric water heaters, leading to a net reduction in per unit energy demand for water heating. Per cent fuel shares for water heating are shown in Table 4.7.

Table 4.7 - Residential Water Heating - Fuel Market Shares

(% of Housing Units)

	1980	1990	2000
Fuel Oil	3	0	0
Natural Gas	42	55	54
Electricity	55	43	40
Other*	0	2	6

* Includes wood and solar.

Source: Ontario Ministry of Energy. The 1980 estimates are based on an Ontario Hydro survey.

Appliances

The ownership of certain major appliances is expected to increase during the forecast period. Lighting and appliances are assumed to improve in efficiency by 10 per cent by the year 2000. These applications are projected to account for 19 per cent of residential energy use in 2000, compared with 13 per cent in 1980.

Table 4.8 - Appliance Ownership

(% of Dwelling Units)

	1980	2000
Freezers	54	60
Dishwashers	30	60
Clothes Dryers	53	60
Central Air Conditioning	9	30

Source: Ontario Ministry of Energy. The 1980 estimates are based on an Ontario Hydro survey.

V. TRANSPORTATION SECTOR

V.1 THE DEMAND MODEL

The Ministry's transportation energy demand model separates energy requirements by major activity - passenger transportation, freight transportation and a residual category of other transportation services. Each of these categories is further subdivided by type of service (for example, intercity and urban groupings) and by mode of transportation (for example, automobile, bus, truck, rail, air and marine). The energy demand projections take account of the volume of service, as well as changes in transportation modes and per unit energy consumption. Key assumptions are outlined in section V.4.

V.2 SHORT TERM RESULTS: 1980-1985

Energy used in the transportation sector amounted to 626 PJ or 27 per cent of the provincial total in 1980.

Demand has declined markedly from the peak consumption levels of the late 1970s. Between 1980 and 1982 alone, a 12 per cent reduction has been registered. A combination of macroeconomic influences affecting both the income of consumers and the price of transportation services has brought about this declining trend.

Beginning in 1980, petroleum product prices increased more rapidly than in previous years. Individual consumers responded by decreasing their consumption of transportation services and seeking more efficient modes of transport. For example, in the 1978-82 period, sales of smaller, lighter and more fuel-efficient automobiles increased rapidly. Also, there is limited data that indicate increasing use of ride-sharing and car-pooling during this period.

The response of the freight transportation sector to higher fuel prices is more complex. Efficiency can be achieved in the short-run through driver education programs, scheduling and duty-cycle improvements, improved maintenance and equipment retrofit. Technological advances such as engine and transmission improvements take longer to implement and depend upon capital stock turnover. The rail and marine freight sectors have less scope for gains in operating efficiency and much slower capital stock turnover than the trucking sector.

The other major impact on transportation energy demand in the early 1980s was the severe recession of 1981-82. The decline in real, per capita disposable income that accompanied the recession decreased the demand for transportation services in both the passenger and freight sectors. Passenger vehicle-kilometres travelled declined sharply in 1982 for all modes of travel - automobile, bus, rail and aircraft. In the freight sector, the relatively severe contraction in manufacturing output resulted in a concomitant decrease in general freight shipments in 1982.

As economic recovery proceeds in the 1983-85 period, the demand for transportation services would expand. However, earlier gasoline price increases will lead to continued improvement in the average efficiency of the automobile stock. While some U.S. automobile manufacturers have indicated that they might not be able to meet their corporate average fuel efficiency targets for the 1983-85 model years, new cars are already significantly more efficient than those being replaced. This combination of output and price effects should keep total transportation energy demand fairly stable at current levels.

Table 5.1 Transportation Sector Energy Demand, 1980-85
(Petajoules)

	1980	1981	1982	1983	1984	1985
Petroleum Prod.	625.2	603.4	551.6	566.4	558.9	546.6
Electricity	0.7	0.3	1.3	0.6	0.6	0.6
Other*	0.1	0.3	1.3	2.6	5.1	10.0
Total	626.0	604.0	554.2	569.6	564.6	557.2

* Propane.

Note: Actual data for 1980-82 and projections for 1983-85.

Sources: Statistics Canada and Ontario Ministry of Energy.

V.3 LONG TERM PROJECTIONS: 1985-2000

In 1985, energy consumption in the transportation sector is expected to be about 557 PJ. Refined petroleum products will meet 98 per cent of the total, with gasoline still being the predominant fuel.

By 2000, transportation energy demand is forecast to be 635 PJ, representing an average annual growth of less than one per cent beyond 1985. Despite this growth, the sector's share of Ontario's secondary energy requirements will decline from the current level of 27 per cent to 24 per cent by the turn of the century. Refined petroleum products are expected to continue their dominance but with a smaller market share compared to the early 1980s. Gasoline will maintain its position as the major fuel. However, efficiency improvements and significant substitution by alternative and other petroleum fuels could reduce the gasoline market share to less than sixty per cent of the total.

Transportation energy demand is not expected to exhibit positive growth until the late 1980s. There are two reasons for this.

Average efficiency of the total automobile stock will continue to improve rapidly for several more years in this decade, as older, less efficient stock is replaced with more efficient models. However, by the late 1980s, further fuel gains will become more difficult to achieve as the proportion of inefficient vehicles declines. In addition, improvements in fuel efficiency are subject to economic and technological constraints.

While the pace of efficiency improvements can be expected to diminish over time, the demand for transportation services will increase with economic growth. Eventually, this demand-related increase will exceed the efficiency gain, resulting in positive energy demand growth.

Gasoline demand will decline throughout the forecast period. However, for the reasons previously cited, the rate of decline in the 1990s will be much more moderate than during the 1980s.

Diesel fuel demand is projected to grow at rates greater than the average for all fuels throughout the forecast period. There are two reasons for this. First, there is some fuel switching in the automobile sector. Second, and more important, the growth in freight-transportation service (which is diesel-intensive) is greater than passenger service growth.

The growth rates for the electricity and 'Other' fuel category could be substantial, reflecting the expected shift from petroleum fuels in the long term. However, base year consumption levels are relatively small compared to total energy consumed and the refined petroleum fuels.

Table 5.2 - Transportation Sector Fuel Demand Growth Rates (% per annum)

	1970/80	1980/90	1990/2000	1980/2000
Gasoline	3.0	-2.4	-0.3	-1.3
Diesel	8.3	2.1	3.2	2.6
Turbo	6.2	-3.4	0.8	-1.3
Aviation Gas	2.2	-2.9	0.9	-1.4
Fuel Oil	3.3	2.0	1.6	1.9
Electricity	-	0.0	17.6	8.1
Other*	-	23.7+	7.2	12.4++
Total	3.7	-1.0	1.1	0.1

* Other includes propane, methanol and compressed natural gas.

+ 1985-1990.

++ 1985-2000.

Sources: Statistics Canada and Ontario Ministry of Energy.

Table 5.3 - Transportation Sector Fuel Shares

(% of Total)

	1975	1980	1985	1990	1995	2000
Gasoline	78.0	73.5	70.0	64.1	58.8	55.4
Diesel	10.8	14.9	17.5	19.8	21.6	24.1
Turbo	7.4	7.8	6.4	6.3	6.4	6.1
Aviation Gas	0.3	0.4	0.2	0.2	0.2	0.2
Fuel Oil	3.4	3.4	4.0	4.3	4.4	4.5
Electricity	-	0.1	0.1	0.1	0.3	0.5
Other*	0.0	0.0	1.8	5.1	8.3	9.1

* Other includes propane, methanol and compressed natural gas.

Sources: Statistics Canada and Ontario Ministry of Energy.

V.4 KEY ASSUMPTIONS

A number of macroeconomic variables are used to project the level of transportation activity. Per capita disposable income, population growth and composition, industry production indices, and relative fuel prices influence fuel demands in both the passenger and freight sectors. For instance, an increase in the population over age fifteen compared to the total population increases the demand for passenger transportation services and hence for energy.

In addition to macroeconomic variables, assumptions about future efficiency improvements, fuel choice, and modal choice determine energy requirements. Specific assumptions are discussed below.

Fuel Choice

It is highly likely that automobile energy demands will be predominantly satisfied by gasoline throughout the forecast period. Some shifting to diesel engines is expected, raising the proportion of the automobile stock fueled by diesel from the current level of about one per cent to about nine per cent by 2000. This shift would be larger were it not for constraints on the choice of diesel as a substitute for gasoline. These include the lack of diesel on major transportation routes in Ontario, poor performance in cold weather, emission problems and a possible increase in the relative price of this fuel.

Propane is expected to make a growing and significant contribution to transportation energy requirements. Due to government financial and tax incentives and rapid improvements in the supply and distribution network, propane made substantial advances in the commercial fleet sector in the 1980-83 period. Given the relative price and efficiency advantages of propane over gasoline, it is possible that about 200,000 vehicles could be operating on propane by 2000. The demand for propane could reach 10 PJ or 1.8 per cent of transportation sector demand in 1985, and 32 PJ, or 5.0 per cent, in 2000.

Non-conventional fuels such as methanol and compressed natural gas (CNG) are assumed to make some penetration into the transportation sector by 2000. Initial introduction of methanol in a blend with co-solvents and gasoline is assumed in the late 1980s. Neat methanol is assumed to be phased in gradually in the early 1990s but could gain wider acceptance later in the decade. CNG is assumed to compete with propane and it could supply 1 PJ in 1990, increasing to 3 PJ in 2000. These three forms of alternative fuels are assumed to provide 4.1 per cent of total transportation energy needs in the year 2000 and are concentrated in the urban fleet market.

Passenger Transportation

The growth rate of passenger transportation, measured by vehicle-kilometres travelled, is expected to decline over the 1980-2000 period compared to the 1970-1980 period. This relative decline is attributable to a decrease in population growth, an increase in the real price of gasoline and a lower rate of growth in personal disposable income.

Automobiles are assumed to maintain their dominant position in the passenger sector, accounting for approximately 90 per cent of passenger travel in 2000. Public transit use is expected to increase faster than automobile use, primarily due to relative price changes and increased urbanization.

The automobile stock is assumed to become more efficient as the older cars are replaced by down-sized vehicles in the near term. This process may slow down in the second half of this decade.

However, by 1990, it is assumed that higher oil prices will result in an improvement in new car efficiency of approximately 2.0 per cent annually for the 1989-1994 period, gradually declining to 1.0 per cent annually in the 1997-2000 period. New car efficiency ratings for intercity travel are projected to increase from 10.3 litres/100 km (27.4 M.P.G.) in 1980 to 6.9 litres/100 km (40.8 M.P.G.) in 2000; fuel efficiency in urban transportation could improve from 15.2 litres/100 km (18.6 M.P.G.) in 1980 to 10.2 litres/100 km (27.7 M.P.G.) in 2000.

No major technological changes that affect fuel efficiency are assumed in the bus, train, transit and marine modes. Air transportation holds the greatest promise for efficiency gains in the form of improved design, use of light-weight materials, higher seating densities and more efficient engine design. However, general economic conditions have severely reduced the airline industry's ability to replace older, less efficient planes with a new generation of fuel efficient planes. Therefore, the possible efficiency gains in the airline sector might not be fully realized.

Freight Transportation

The volume of freight transportation depends upon overall manufacturing activity and the mix of commodities transported. Growth in general freight tonne-kilometres shipped is projected to average 1.7 per cent per year over the 1980-2000 period.

Freight volume also depends upon economic growth in the four major resource groups transported within and across Ontario (iron ore, grain, coal and forest products). Growth in total tonne-kilometres in this specific freight sector could average 1.2 per cent annually over the 1980-2000 period.

Urban freight trucking depends upon general industrial activity and the urban/rural population ratio. Urban freight trucking tonne-kilometres are projected to increase 1.0 per cent annually over the forecast period. Non-freight urban trucking vehicle-kilometres are projected to average 1.6 per cent annually over the same period.

Diesel penetration of the trucking sector is expected to increase. The resulting efficiency gains would moderate the growth in energy demand arising from freight volume increases. In addition, operating improvements are assumed to contribute 0.2 per cent annually to trucking sector efficiency.

Refined petroleum products (gasoline, diesel, heavy fuel oil) are assumed to supply all of the energy requirements in trucking, and almost all in the urban freight sector (where some propane and methanol might be used). No allowance is made for the possible electrification of the Windsor to Cornwall rail corridor. Also, neither marine nor rail is expected to revert to coal use.

VI. ENERGY SUPPLY SECTOR

VI.1 METHODOLOGY

In the Ministry of Energy model, consumption in the energy supply sector includes:

- oil for petrochemical feedstock;
- oil for other non-energy products (eg. asphalt, lubricants and greases);
- oil consumed by petroleum refineries;
- natural gas used by oil refineries, pipelines and gas utilities (petrochemical uses are included in the industrial sector);
- fossil fuels used by utilities and industry to generate electricity;
- energy used to generate steam for the Bruce Heavy Water Plant;
- electricity used by petroleum refineries, pipelines and utilities;

- electrical energy from hydraulic and nuclear sources converted to a primary energy value (10.5 MJ/kWh); and

- losses in transmission of electrical energy.

It excludes net electricity exports and fuels used to generate such exports.

Key assumptions regarding the energy supply sector are dealt with in section VI.6.

VI.2 SUMMARY OF RESULTS

Little growth is expected over the 1980-2000 period in the demand for oil as a petrochemical feedstock or for other non-energy uses in Ontario although a near term recovery is expected from low 1982 levels. By 1990, oil used in refining is expected to fall to 78 per cent of the 1980 amount due to both the extensive conservation measures adopted by the refining industry and the falling demand for oil. By 2000, this number could be 82 per cent of the 1980 level. In the case of natural gas, no significant change is expected in consumption by the energy supply sector.

Electricity use by the energy supply sector is expected to grow at a slow rate (less than 1 per cent per annum) due to a decline in oil refining and pipeline use and reduced transmission losses resulting from the installation of higher efficiency 500 kV transmission lines. Primary energy requirements for electricity generation are forecast to grow at an average annual rate of 2.2 per cent between 1980 and 2000.

Nuclear power demand for electrical generation is expected to grow at a relatively fast rate over the period (4.9 per cent per annum versus 0.4 for hydraulic and a reduction for each of the fossil fuels). Consequently, the nuclear share of provincial generation is expected to increase from 35 per cent in 1980 to 58 per cent by the year 2000.

The share of Ontario primary energy met by indigenous sources is projected to rise to about 37 per cent in 1995.

Table 6.1 - Growth Rates for Fuels Used for Electricity Generation in Ontario

(% per annum)

	1970/80	1980/90	1990/2000	1980/2000
Nuclear	42.4	7.0	2.7	4.9
Hydraulic	0.3	0.0	0.8	0.4
Coal	3.3	-6.4	4.5	-0.9
Oil	-13.8	0.0	-11.6	-5.6
Natural Gas	5.7	-4.8	7.2	1.1
Total	5.4	1.9	2.4	2.2

Sources: Statistics Canada and Ontario Ministry of Energy.

Table 6.2 - Fuel Shares for Electricity Generation in Ontario

(% of Total)

	1975	1980	1985	1990	1995	2000
Nuclear	15	34	45	56	56	58
Hydraulic	48	39	35	32	30	27
Coal	25	26	19	11	13	14
Oil	1	0	0	0	0	0
Natural Gas	11	1	1	1	1	1

Note: Does not include generation for net exports.

Sources: Statistics Canada and Ontario Ministry of Energy.

VI.3 KEY ASSUMPTIONS

Oil: Petrochemical feedstock use is unlikely to increase significantly in Ontario over the forecast period following a partial recovery from low 1982 levels. The demand for other non-energy products will rise slowly over the period.

In 1982 only about 1 PJ of oil was used to raise steam for the Bruce Heavy Water Plant. No increase is assumed.

Natural Gas: Of the 10 PJ of natural gas used to generate electricity in Ontario in 1982, less than one-tenth was used by Ontario Hydro. The rest was used for industrial generation. While Ontario Hydro's use of natural gas is expected to drop to virtually zero, industrial generation will continue to grow.

Electricity: Transmission and distribution losses are assumed to be 9.38 per cent of final demand. Losses will decrease as more 500 kV transmission is introduced into the system.

The small utilities in the Province will add small amounts of new generation and their fuel is assumed to be mostly hydraulic. Industrial generation is about 40 per cent hydraulic with the rest being mostly gas-fired. Much of the fossil fuel generation is cogeneration of steam and electricity. Cogeneration capacity is expected to more than double by the year 2000. Industrial generation and small utilities currently supply about 6 per cent of Ontario's electricity demand. Additional generation is expected from small-scale hydro and energy from waste.

The projections of primary fuel requirement for Ontario Hydro generation are based on the existing system expansion program. Hydraulic capacity is expected to increase by about 650 MW of peaking capacity by the end of the century. Nuclear output is based on a load factor consistent with both the system load pattern and the technical and economic operating characteristics of nuclear plants. Oil and gas used to generate electricity by Ontario Hydro is not significant and is expected to decrease to almost zero.

APPENDIX ONE: TOTAL ENERGY DEMAND BY SECTOR AND FUEL FOR 1980, 1985, 1990, 1995 AND 2000

TABLE A.1

TOTAL ONTARIO ENERGY DEMAND BY SECTOR AND FUEL

1980

(Petajoules)

	Coal	Oil	Natural Gas	Electricity	Hydro	Nuclear	Other	Total
Residential		148	209	118			10	485
Commercial		46	140	99				285
Industrial	209	153	356	134			47	899
Transportation	—	625	—	1	—	—	—	626
Total Secondary	209	972	705	352			57	2,295
Petrochemical		129						129
Non-Energy		66						66
Energy Industry		121	28	36				185
Electrical Gen.	282	3	16	—	423	400	—	1,124
Total	491	1,291	749	388	423	400	57	3,799
Less Electricity	—	—	—	388	—	—	—	388
Total Primary	491	1,291	749	-	423	400	57	3,411

Source: Ontario Ministry of Energy

TABLE A.2

TOTAL ONTARIO ENERGY DEMAND BY SECTOR AND FUEL

1985

(Petajoules)

	Coal	Oil	Natural Gas	Elec- tricity	Hydro	Nuclear	Other	Total
Residential		86	242	133			13	474
Commercial		36	148	106				290
Industrial	207	114	317	137			60	835
Transportation	—	546	—	1	—	—	10	557
Total Secondary	207	782	707	377			83	2,156
Petrochemical		102						102
Non-Energy		59						59
Energy Industry		95	29	44				168
Electrical Gen.	232	3	10	—	420	557	2	1,224
Total	439	1,041	746	421	420	557	85	3,709
Less Electricity	—	—	—	421	—	—	—	421
Total Primary	439	1,041	746	-	420	557	85	3,288

Source: Ontario Ministry of Energy

TABLE A.3

TOTAL ONTARIO ENERGY DEMAND BY SECTOR AND FUEL

1990

(Petajoules)

	Coal	Oil	Natural Gas	Electricity	Hydro	Nuclear	Other	Total
Residential		49	258	145			14	466
Commercial		26	155	116				297
Industrial	250	130	409	154			66	1,009
Transportation	—	537	—	1	—	—	29	567
Total Secondary	250	742	822	416			109	2,339
Petrochemical		113						113
Non-Energy		69						69
Energy Industry		94	29	48				171
Electrical Gen.	151	3	10	—	420	765	3	1,352
Total	401	1,021	861	464	420	765	112	4,044
Less Electricity	—	—	—	464	—	—	—	464
Total Primary	401	1,021	861	-	420	765	112	3,580

Source: Ontario Ministry of Energy

TABLE A.4

TOTAL ONTARIO ENERGY DEMAND BY SECTOR AND FUEL

1995

(Petajoules)

	Coal	Oil	Natural Gas	Electricity	Hydro	Nuclear	Other	Total
Residential		36	254	156			15	461
Commercial		21	167	134			2	324
Industrial	277	136	433	177			71	1,094
Transportation	—	552	—	2	—	—	50	604
Total Secondary	277	745	854	469			138	2,483
Petrochemical		124						124
Non-Energy		71						71
Energy Industry		96	30	53				179
Electrical Gen.	184	3	15	—	446	860	4	1,512
Total	461	1,039	899	522	446	860	142	4,369
Less Electricity	—	—	—	522	—	—	—	522
Total Primary	461	1,039	899	-	446	860	142	3,847

Source: Ontario Ministry of Energy

TABLE A.5

TOTAL ONTARIO ENERGY DEMAND BY SECTOR AND FUEL

2000

(Petajoules)

	Coal	Oil	Natural Gas	Elec-tricity	Hydro	Nuclear	Other	Total
Residential		23	248	166			16	453
Commercial		17	174	154			3	348
Industrial	310	145	490	209			81	1,235
Transportation	—	574	—	3	—	—	58	635
Total Secondary	310	759	912	532			158	2,671
Petrochemical		137						137
Non-Energy		73						73
Energy Industry		100	31	59				190
Electrical Gen.	234	1	20	—	454	996	5	1,710
Total	544	1,070	963	591	454	996	163	4,781
Less Electricity	—	—	—	591	—	—	—	591
Total Primary	544	1,070	963	-	454	996	163	4,190

Source: Ontario Ministry of Energy

POOR

QUALITY

ORIGINAL